Federation of Rhodesia and Nyasaland

REPORT

of the SECRETARY to the FEDERAL MINISTRY OF AGRICULTURE

For the Year Ended 30th September, 1956

Presented to the Federal Assembly
1957

Price 10/6 per copy

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REPORT OF THE SECRETARY TO THE FEDERAL MINISTRY OF AGRICULTURE WHICH INCLUDES THE DEPARTMENTS OF RESEARCH AND SPECIALIST SERVICES, CONSERVATION AND EXTENSION SERVICES, VETERINARY SERVICES, AND TSETSE AND TRYPANOSOMIASIS CONTROL AND RECLAMATION, FOR THE YEAR ENDED 30TH SEPTEMBER, 1956.

J. R. CORRY, SECRETARY FOR AGRICULTURE.

I. INTRODUCTION

The season 1955-56 was, on the whole, a favourable year for agriculture except for a dry spell during January which was particularly severe in the Midlands and Matabeleland. The rains continued well into the autumn and were in fact excessive in all areas for this time of the year. Although the season could not, therefore, be described as ideal owing to the somewhat uneven distribution of the rain in some areas record crops of both maize and tobacco, resulting from increased yields per acre as well as increased acreages, were nevertheless obtained, whilst dairy production showed a further substantial increase over the preceding year's record figures.

Due to the late rains and mild winter the season was a particularly good one for livestock and a steady and encouraging improvement is evident generally in the care, feeding and management of both beef and dairy herds.

On the whole the period under review has again been characterized by a high degree of overall stability in the general economic climate both of the Federation and of the world as a whole.

Locally, under the demanding influences of a rapidly expanding economy, many costs and prices have continued to rise, but the upward movement has been slow and as far as the farmer is concerned has been offset to some extent by compensatory increases in output and yield per acre resulting from improved farming practices coupled with the beneficial effect of a fifth consecutive favourable season.

II. ADMINISTRATIVE SERVICES

Transfer of Non-African Agriculture in Northern Rhodesia. As forecasted in the Ministry's previous Annual Report, Non-African Agriculture in Northern Rhodesia became a Federal responsibility on the 1st January, 1956, in terms of the Northern Rhodesia Non-African Agriculture (Transfer to the Concurrent List) Ordinance, 1955, which defined Non-African Agriculture as follows:—

> "2. "Agriculture" means agriculture in general, including animal husbandry, dairies and dairy farming, horticulture, poultry and bee-keeping, but does not include forestry or irrigation.
>
> "Non-African agriculture" means any agriculture carried on by or on behalf of a non-African or by a tenant of a non-African but does not include any agriculture carried on by a non-African for or on behalf of an African or any association of Africans.
>
> 3. In the application to the Territory of the Concurrent Legislative List set out in the Second Schedule of the Federal Constitution there shall be included in that list as from the date of coming into force of this Ordinance any matter relating to non-African agriculture and plant pests and diseases."

Agriculture as defined in the Ordinance includes Conservation but excludes Research and Specialist Services as well as Animal Health which remain as Territorial responsibilities.

The general organization and supervision of non-African agriculture as defined in the Ordinance became the responsibility of the Department of Conservation and Extension and further details in connection therewith are supplied in the Annual Report of the Director of that Department.

There is little doubt that this transfer should prove of considerable benefit to farmers in Northern Rhodesia in that it is possible to provide them with advisory services—and with the results of the vast Federal Research Organization in Southern Rhodesia—covering the entire field of agriculture at the same level as enjoyed by Southern Rhodesian farmers.

Standing Committee on Agricultural Production. The Federal Standing Committee on Agricultural Production whose terms of reference are generally to consider all matters of agricultural policy throughout the Federation and to make recommendations to ensure that the closest co-operation is maintained between the Ministry and the Territorial Governments, examined various policy matters referred to it from time to time and submitted recommendations thereon to the Federal Minister of Agriculture.

Its main task during the year however was the framing of an agricultural policy for the Federation on broad general lines but this important exercise which will no doubt have far reaching effects on agricultural development in the Federation, had not been completed at the end of the year under review.

Tsetse Fly and Trypanosomiasis. In conformity with the recommendations contained in the report of the Commission of Inquiry set up in 1955, to inquire into all matters relating to human and animal trypanosomiasis in Southern Rhodesia, the existing Tsetse Fly Operations Branch of the Department of Research and Specialist Services, was expanded, as from 1st July, into a separate Department of the Ministry with its own Director, whilst a new Committee designated "The Committee for Tsetse and Trypanosomiasis Control" was also set up with the following membership:—

Chairman (a non-official with professional knowledge).

Director of Veterinary Services or his representative.

Director of Medical Services or his representative.

Director of Research and Specialist Services or his representative.

Secretary for Native Affairs or his representative.

Game Officer.

Representative of Rhodesia National Farmers' Union.

Representative of Forestry Commission.

Director of Tsetse and Trypanosomiasis Control and Reclamation.

Representative of Natural Resources Board.

Nominee of the Natural Resources Board.

Nominee of the Ministry of Agriculture.

The functions of this Committee, which is at present a non-Statutory body, are to debate and recommend policy, direction of operations being delegated to a Standing or Executive Committee, consisting of the following members:—

Chairman of the main committee.

The Director of Tsetse and Trypanosomiasis Control and Reclamation.

Secretary for Native Affairs or his representative.

Director of Veterinary Services or his representative.

Game Officer.

A non-official member of the main committee nominated by the Minister of Agriculture.

Various other recommendations of the Commission of Inquiry were also implemented and are referred to in the Annual Report of the Acting Director of the new Department.

Agricultural Marketing Council. The Federal Agricultural Marketing Council Act, which replaced the Southern Rhodesia Agricultural Marketing Council of 1951, came into operation during the year; by bringing this legislation into force the Federal Government has completed the first stage in the extension of its pricing and marketing policies to Northern Rhodesia.

The legislation sets up an Agricultural Marketing Council consisting of an independent Chairman with producer and consumer representation from each of the Southern and Northern Rhodesian areas together with official, non-voting representatives from the Federal and Territorial Governments. Provision exists for the extension of the activities of the Council to cover price and market considerations relating to Nyasaland, with appropriate producer, consumer and official representation.

The Council will have the important annual task of reviewing the general economic condition and prospects of the agricultural industry and recommending on the prices of such products as are considered appropriate for control; as indicated in the legislation it will be the function of the Council, *inter alia*, to—

(i) advise the Minister on all matters connected with the prices of any product, including long-term prices, market guarantees and subsidies, and, in particular, to make recommendations for the proper co-ordination of such prices;

(ii) on the instructions of the Minister, to investigate or cause to be investigated agricultural marketing conditions in general or the conditions relating to any particular product or ruling on any particular market;

(iii) on the instructions of the Minister, to examine the operation of any statutory board or commission concerned with the processing or marketing of any product, and for this purpose such statutory board or commission shall give access to its records to any member and to any other person authorized by the chairman to examine its operations.

Agricultural Economics and Marketing. The greater part of the time of the Chief Agricultural Economist has been taken up either with the review of old agricultural policy necessitated as a result of Federation or with the settlement of problems arising from the same cause. He was intimately concerned with the detailed proposals for the transfer to Federal control of European agriculture and has been closely associated with the preliminary co-ordination of marketing arrangements as between Southern and Northern Rhodesia. He has served as Chairman of the Sub-Committee set up to arrive at detailed arrangements for the Federal marketing of grains and has been responsible for the preparation of a draft Federal Grain Marketing Bill, which will shortly

be released to the various interested parties. He has also served as Chairman of the Federal Cattle and Beef Advisory Committee arising out of the report of the Turner Commission and has been appointed as a permanent member of the Federal Tariff Commission established to advise Government on industrial policy and tariff and financial assistance to industry and he is also a permanent member of the Government's Trade Agreement Working Party. In addition to serving as a member of the Standing Committee on Agricultural Production, the Shire Valley Working Party, and the Government's Standing Committee on Action and Priorities, he has served on a large number of *ad hoc* advisory committees and working parties during the course of the year and was a member of the team which met the representatives of the Government of the Union of South Africa in the review of the Trade Agreement with that territory during July. The Chief Agricultural Economist or a member of his staff has continued to attend all meetings of the Cold Storage Commission, the Grain Marketing Board, the Dairy Marketing Board and the Tobacco Marketing Board.

The Branch has continued to be responsible for the Co-operative movement and a great deal of detailed advice and assistance has been given to the various Co-operatives. Further progress has been made also towards the possibility of Federal Co-operative Company legislation.

Throughout the year, the Branch has provided a steady volume of information on the economics and marketing and on the production and pricing of agricultural products throughout the Federation both on a factual basis and on a basis of comment and suggestion. It has also been called upon to provide a great deal of information for the benefit of various Territorial Governments in relation to projects in hand or contemplated for the development of sugar production, citrus production and other matters. The Chief Agricultural Economist was also appointed to the committee established by the Southern Rhodesia Government to look into the possibility of establishing a land settlement scheme for European immigrants based on intensive agriculture. This committee was established as a result of a Report prepared by Dr. Weizmann, an international land settlement expert, who reported on the possibilities of this kind of development in Southern Rhodesia.

The Branch has also continued to administer a growing volume of agricultural import and export controls relating to the control of produce throughout the Federation.

Agro-Economic Survey and Cost Inquiries. The final draft report on the Agro-Economic Survey of Southern Rhodesia was completed during the year and it is hoped that the printed report will be available shortly; in the report the country has been divided into five Natural Farming Regions based on the efficiency of the rainfall and taking into account total precipitation, temperatures, incidence of drought and soils. This division will provide invaluable guidance for the development of sound farming systems for the different regions. The survey will also provide a far more reliable estimate of the Agricultural potential of the country than has hitherto been possible. Such basic information is of the utmost value in formulating long-term agricultural policy.

The results of the Economics and Markets Branch's three-year inquiry into the costs of milk production have now been published in report form. This survey has been of great value in indicating not only the present cost of producing milk but the many weaknesses in the managerial side of milk production.

The Economics and Markets Branch has never been particularly happy with the techniques employed for the collection of commodity cost information which are open to certain serious criticisms. Because of this considerable attention has been devoted in the past to the devising of foolproof methods of cost and other miscellaneous official information relating to farming activities. The Chief Agricultural Economist took the precaution of obtaining the comments of the Agricultural Economics Research Institute, Oxford, of the University of Leeds and Reading in the United Kingdom, and the Economics Division of the United Kingdom Ministry of Agriculture and the Economics and Markets Branch of the Union of South Africa Government on the technique he proposed to employ in connection with a full scale inquiry into the cost of maize production, and is able to report that this scheme was launched during the current year on a basis fully approved and supported by all these important authorities. The scheme was launched in respect of the 1955-56 crop with 120 collaborators. Shortages of staff here and the onerous demands for information, the scheme being based on the presentation of full farm accounts, has resulted in an unexpectedly high rate of drop out. Nevertheless, it is believed that the first results of the survey will be of great interest and extremely illuminating with regard to the present state of the maize industry.

At the same time, the Branch has again conducted and completed a routine inquiry into the cost of maize production during the 1954-55 season, as required under the terms of the Government's agreement with the Rhodesia National Farmers' Union. At the request of the Tobacco Marketing Board the Branch carried out a quick survey inquiry into the cost of producing tobacco. The results related to the 1955-56 crop and provided valuable information for the briefing of the Board's delegation which went to London to negotiate with the Board of Trade and the Tobacco Advisory Committee. This brief and somewhat hasty survey is being followed up during the 1956-57 season with a full cost investigation using the techniques now being applied to the maize inquiry.

The demands for the services of the Branch in connection with the farm planning activities of the Department of Conservation and Extension have continued unabated.

Rhodesia Agricultural Journal and Library

Rhodesia Agricultural Journal. The contract for printing the Journal expired on 31st December, 1955, and was taken over by the Federal Printing and Stationery Department as from 1st January, 1956.

Throughout the year the Journal was published on time.

Library. The Librarian continued to act as Secretary of the Library Committee. The method of ordering books remained the same as in the past although Heads of Branches are still pressing for authority to order their requirements direct thereby saving considerable time. The allocation for books and periodicals was very satisfactory. Distribution of books on arrival was handled by the Secretary of the Library Committee and also the checking of accounts for same.

Literature continued to be circulated throughout Head Office, the Laboratories, Research Stations and Gwebi College.

This circulation system however is far from satisfactory and each year losses occur which cannot be replaced.

As emphasized in previous reports, there is a very urgent need for more library accommodation.

III. CROP PRODUCTION

Maize. The total acreage planted to maize by Europeans in Southern Rhodesia for the 1954-55 crop was the largest ever recorded up to that date and amounted to 364,059 acres or an increase of 4,350 acres over the 359,709 acres planted in 1953-54. The crop totalled 2,734,920 bags, 47,606 bags higher than the previous season's record crop. The yield per acre was 7.51 bags, much the same as in the previous season when it ran at 7.47 bags per acre. The production of this record crop in Southern Rhodesia was partially offset by a decline in the acreage planted to maize by European farmers in Northern Rhodesia from 116,722 acres in 1953-54 to 105,703 acres in 1954-55. The crop amounted to 644,371 bags—an average yield of 6.1 bags as against 757,519 bags with a yield of 6.5 bags per acre in the previous season. Nevertheless, consumption showed no great increase in Northern Rhodesia and both Territories commenced the intake season for the 1955-56 crop, viz. the 1st July, 1956, with substantial stocks of maize on hand. In fact, in Southern Rhodesia, the Grain Marketing Board for the first time in its history commenced the intake season with a six months' supply of maize in storage.

By the end of September it became apparent that total deliveries from the 1955-56 crop of European and African grown maize, in both territories, would break all previous records and would be greatly in excess of all forecasts.

In fact by the end of September the Southern Rhodesia Grain Marketing Board had already received 1,875,000 bags of European grown maize and 767,000 bags of African crop with further and heavy deliveries still expected and it seemed fairly obvious that even after allowing for a local annual consumption requirement of up to 2,300,000 bags and a reserve carry-over of approximately half this quantity, the Grain Marketing Board would end the intake season with a substantial surplus of maize in hand. (In actual fact the Grain Marketing Board received by 31st October, 1956, one million bags of maize in excess of the total forecast for the 1956-57 intake.)

Small Grains—Kaffir-corn, Munga and Rupoko. The producer price of kaffir-corn has been determined mainly in relation to the maize price during the last few years. At one time, in an effort to stimulate production in the lower rainfall areas, this price was put on a parity with maize and partly on this account and partly as a result of favourable seasons, large quantities were marketed. The stocks of the Grain Marketing Board accumulated and as a result of its low keeping quality, this grain had to be disposed of rapidly at a substantial loss. Stocks of old crop kaffir-corn selling at 28/- a bag were exhausted in August, 1954, and with effect from the 1st April, 1955, the Board's selling price was fixed at 35/-. Simultaneously, an adjustment was made in the producer price which was dropped to 35/6d. As a result of this and a mediocre season, supplies of new crop were received on such a limited scale that sales were virtually confined to specialist usings such as brewing and poultry feeds, and the overall position changed to the extent that stocks on hand at the end of September represented materially less than 12 months' requirements, A system of rationing was therefore introduced in October and the price of the product raised to the unsubsidized price of 39/3d. to all users except stock feeders, sales to whom continued to be made at 35/-. With effect from the 1st July, 1956, the selling price of kaffir-corn has been raised to 41/8d. for general purposes, with a rebate of 5/8d. per bag when the grain is used in stockfeeds. This adjustment was made as a result of recent experience which has established the fact that there is a regular call on this grain for limited quantities at parity prices with maize and even in excess of the maize price.

The producer price for Class "A" kaffir-corn for the 1955-56 crop was fixed at 37/6d. per bag compared with a price of 41/6d. per bag for maize.

Reference was made in the Ministry's previous annual report to the fact that sales of munga during the preceding season had increased so rapidly under the stimulus of heavy subsidy that the Grain Marketing Board had found it necessary, at the beginning of October, 1955, to introduce

rationing to reduce sales and ensure the equitable distribution of its limited crop. As from that date also, the selling price of this grain, to users other than stock feeders, was raised to the unsubsidized price of 41/8d. per bag, stock feeders or stock feed merchants being entitled to a refund of 11/8d. per bag upon production of a certificate to the effect that the supplies drawn had been utilized solely for stock feed purposes. On the 1st July, 1956, the rebate was reduced to 5/8d. per bag, the Board's selling price of munga for stock feed being thus increased from 30/- to 36/- per bag. The decrease in the rebate resulted in some weakening in the demand for this grain but the supply position at the time was such that the Board was unable to abandon its rationing arrangements.

The producer price for the 1955-56 crop was fixed at 37/6d. per bag, i.e. the same price as kaffir-corn and total stocks of munga held by the Grain Marketing Board at the end of September—35,377 bags—represented approximately five months' supply on a rationed basis.

On the 1st April, 1955, the Grain Marketing Board's stocks of rupoko were 8,414 bags which, with deliveries from the 1954-55 crop forecasted at 75,000 bags, were expected to be adequate to meet all foreseeable requirements. However, the position was somewhat uncertain and in consequence of this the Board agreed that merchants should be allowed to import their requirements where necessary. By October of that year however it became obvious that deliveries would be very light and supplies inadequate due, it was claimed, to the low price offering for this product, in consequence of which considerable quantities of rupoko were being "black marketed" at prices in excess of the Board's price.

In the face of an offer from Kenya, therefore, the Board agreed to import approximately 55,000 bags of rupoko at a landed price of 66/7d. per bag. These imports enabled the Board to build up its stocks and exercise a stabilizing influence on the rupoko market.

The price of rupoko for the 1955-56 crop was fixed at 65/- per bag compared with 48/- per bag for the previous crop and the season closed with more than sufficient stocks on hand to meet all expected demands during the ensuing 12 months.

Groundnuts. There has been no change in the general groundnut marketing situation in Southern Rhodesia. The European continues to be a negligible producer and the African continues to contribute the greater part of the commodity coming on to the market. Deliveries to the Grain Marketing Board up to the end of October, 1956, amounted to 137,000 bags of shelled groundnuts and 2,800 bags of unshelled groundnuts. The price for the 1955-56 crop is fixed at 75/- per 183 lb. gross and the great bulk of the output has again been disposed of to the local oil expressors. The general situation under which the Southern Rhodesian producers' price is tied to the value of the crop on the local industrial market has been seriously contested during the year by the Southern Rhodesian Government, and is at present the subject of a detailed inquiry by the Agricultural Marketing Council. The Northern Rhodesian and Nyasaland producers continue to have the opportunity of selling their nuts at high ruling world prices and have taken full advantage of this position. Up to date, information relating to the Northern Rhodesian crop is not available but the Nyasaland authorities have sold approximately 11,000 tons of groundnuts this year at an average f.o.r. Limbe price of between £61 and £61 10s. 0d. per long ton, or approximately 95/- per bag of 180 lb. Most of these nuts have gone to United Kingdom ports at a c.i.f. price of approximately £72-£73.

Potatoes. The second irrigated crop harvested in the early summer of 1955 did not suffer from the depredations of blight and but for the heavy frosts early in the growing season would have been large enough to supply all Southern Rhodesia's needs until the main crop was ready for lifting in February, 1956. An attack of tuber moth occasioned by the late onset of the rains reduced the saleable quantities of this crop and it became necessary to import from the Union for approximately a month before the main crop was ready. No especial difficulties were encountered by producers in realizing the top prices for good quality produce although the Potato Pool paid out overall 3d. per bag less than the prescribed maximum price. Because of the incidence of blight the main crop plantings were not on an extensive scale, and coupled with attacks of blight resulted in the total production from this crop only being sufficient to meet Southern Rhodesian requirements for about two months. The main varieties which were planted to this crop were Pentland Ace and Kennebec. Kennebec proved itself almost entirely resistant to blight while the Pentland Ace plantings were attacked by blight but after the crop was assured. After the main crop was exhausted, it was again necessary to resort to import from the Union. Plantings of the first irrigated crop in 1956 were sufficiently large to meet all local requirements until the second irrigated crop became available, but the continued and prolonged late rains, combined with dull overcast weather caused an outbreak of blight on this crop and reduced yields so that it was necessary first to continue importing for a longer period than at first thought necessary and secondly to resume importations where it had been hoped that none would be required. Just before the bulk of the crop came on to the market, prices in the Union rose to levels in excess of the local price. The second irrigated crop of 1956, judged on seed sales, promised to be larger than for many years and promised also a certain amount of difficulty in marketing. The main 1955-56 crop and the first irrigated crop experienced no such difficulty and producers were able to dispose of all good quality potatoes at the prescribed maximum price.

Rice. Under the stimulus of a guaranteed market, made possible by virtue of import controls operated by this Ministry, producers in Nyasaland have again succeeded in growing all the first

quality rice requirements of the Federation at prices in line with world values. Moderate quantities of second quality and broken rice surplus to requirements have had to be exported.

Tobacco. Tobacco has once again had an excellent season and for the fourth year in succession production has struck an all-time record. Production of nondescript types has unfortunately remained high and in excess of last year's level. However, this season the Tobacco Marketing Board changed its nondescript classification and the actual grades falling into the new classification did not exceed 15.9%. The percentage of high quality tobacco offering was low and the main bulk of the crop fell into the middle and lower quality classifications. Partly as a result of this and partly as a result of the unexpectedly high level of production, the marketing season which has just passed has been a difficult one.

The market opened at the beginning of the season on a somewhat erratic note; prices were not considered satisfactory by the majority of growers and a large number of consignments were withdrawn. By the 9th April deliveries had slowed down to such an extent that stocks in hand were only sufficient for a further two and a half days sale and were still declining. The Tobacco Marketing Board decided thereupon to suspend further auctions pending discussions with the principal buyers. Sales were resumed about ten days later and continued thereafter in the normal manner, the market eventually settling down although at a level much below prices prevailing in previous seasons. As mentioned above the quality of the crop was disappointing, although the tobacco appeared to be excellent in the field. Various explanations have been advanced to account for this but it seems fairly clear that a great deal of the tobacco was badly handled owing to insufficient accommodation and labour to deal with the unexpectedly large quantity of tobacco which was reaped; there is little doubt also that the crop suffered severely as the result of the January drought followed by excessive and continuous rain.

For the first time, the tobacco produced in Southern Rhodesia and in the North-Western area of Northern Rhodesia was sold as a single crop, total sales of flue-cured Virginia tobacco from the two areas over the Auction Floors amounting to 171,629,668 lb. and resulting in a total realization of £23,569,144 3s. 5d. or an average price per lb. of 32.96d. compared with an average realization of approximately 40d. per lb. in the previous year.

In addition 1,979,258 lb. of flue-cured tobacco were sold from North-Eastern Rhodesia for £195,929 3s. 1d. at average price of 23.76d. per lb. compared with 27.21d. per lb. in the previous year.

There has been indication of a revival of interest in the production of Turkish tobacco, the number of registered growers in Southern Rhodesia rising from 528 to 572 of whom 247 were African producers.

The fire-cured Virginia crop produced in Southern Rhodesia reached a figure of 342,482 lb. as compared with 276,726 lb. in 1954-55 but the average price realized of 9.93d. per lb. showed a considerable decrease from the previous year's average realization of 16.30d. per lb.

An important feature of the 1956 season has been the heavy rate of purchase of the South African buyers following their re-entry into this market in 1955. After appropriate consultation, as required under the Trade Agreement between the two territories, the Union Government declared a duty free quota from the Federation of 14,500,000 lb. of flue-cured Virginia tobacco plus a further 5,500,000 lb. of air- or fire-cured types.

The United Kingdom has been a heavy buyer, its purchases reaching a figure of 87½ million lb. as compared with the agreed minimum of 83 million lb. Australia has also taken its full share of purchases whilst the market has again been well supported by Continental buyers.

The comparative figures in respect of destination of purchases are as follows:—

Destination	1954/55	1955/56
United Kingdom	53·88	51·09
Australia	8·01	5·41
Local Market	5·20	4·52
Other Markets	32·83	38·94
Unallocated	·08	·04
	100·00	100·00

Purchases of the North-Eastern Rhodesian crop have not followed the above pattern very closely. Very much less interest has been displayed by the United Kingdom in the North-Eastern Rhodesian product and the shortfall has been taken up by the Federal market with the Continental support remaining unchanged. Australia has not been a buyer of North-Eastern Rhodesian tobacco.

The marketing of Nyasaland tobacco and of North-Eastern Rhodesian Burley and sun-cured leaf does not come under the control of the Federal Government though this is responsible for the general export control of these commodities. It is, however, interesting to note that during the 1956 selling season Nyasaland has sold 4,089,594 lb. of flue-cured tobacco at a total value of £392,758 for an average price of 23.05d. per lb. Sales of fire-cured tobacco have amounted to 25,299,326 lb. at a total realization of £1,783,497 or an average price of 16.91d. per lb. Sales of Nyasaland sun-

cured tobacco have amounted to 2,676,023 lb. at a total realization of £216,208 or an average of 19.39d. per lb. As against this the sun-cured leaf produced in the North-Eastern Province only amounted to 13,505 lb. and was disposed of at an average price of 13.88d. per lb. The total marketed production of Nyasaland Burley amounted to 2,271,718 lb. at a total value of £216,615 or an average price of 22.88d. per lb. whereas the North-Eastern Rhodesian Burley amounted only to 186,872 lb. at a total value of £19,228 or an average price of 24.75d. per lb.

Cattle. Reference was made in the previous Annual Report to the fact that despite prolonged and careful negotiations it had not been possible to reach agreement in regard to the findings of the report of the Federal Cattle and Beef Marketing Committee which had recommended a major overhaul of the cattle marketing system to take account of the widely differing systems prevailing in the two Rhodesias. In view of this impasse and the need to find an early solution to the growing problems arising from existing cattle marketing arrangements, the Federal Government decided to set up a special commission to inquire into cattle marketing in Southern Rhodesia. This Commission of Inquiry, under the Chairmanship of Sir Henry Turner, was charged with the task of inquiring into the marketing of slaughter stock and the sale and distribution of beef in Southern Rhodesia and of making recommendations as to the broad principles which should be adopted in devising a system of marketing most likely to advance the cattle industry in Southern Rhodesia in consonance with the general welfare of the community having regard in particular to ensuring—

(a) such measure of price stability as will promote the healthy expansion of the cattle industry;

(b) equal opportunities for cattle producers, regardless of race;

(c) the equitable distribution of beef at fair prices to consumers;

(d) that maximum economies in the marketing and distribution of slaughter stock and beef, consonant with other major objectives are effected; and

(e) the evolution of a marketing pattern which may eventually serve the needs of the Federation.

This Commission recommended certain sweeping changes in the system of cattle marketing hitherto practised in Southern Rhodesia, the basic principle emphasized in the report being that there should be the maximum possible freedom for private enterprize and the minimum of interference by Government in the whole field of cattle marketing and beef distribution so that the producer would be free to sell where he pleased, that is to say he could dispose of his cattle at auction sales, by private treaty or to the Cold Storage Commission; the butcher in his turn being free to buy at auction sales, by private treaty or from the Cold Storage Commission whilst the consumer would be free to buy selectively on an open market at uncontrolled prices.

The Commission of Inquiry pointed out also that there was a general shortage of slaughter cattle in relation to the demand for beef and that on existing trends the position appeared to be deteriorating and concluded that the additional output required to meet the domestic demand could, over long term, be brought about from local production more economically than by importing supplies; it recognized also that prevailing prices had not offered sufficient inducement to the producer of cattle and recommended that a system of hook auctions should be instituted under which cattle carcases would find their own value in relation to consumer demands in the confident anticipation that this would result in a material price increase to the producers.

The Federal Government decided to implement the main principles underlying the report of the Commission of Inquiry and all legislation controlling the purchase and sale of slaughter cattle and rationing of beef and cattle was repealed whilst retail price control of beef was suspended.

It was decided not to introduce hook auctions for the time being partly because conditions in the Union of South Africa appeared to be still somewhat uncertain after four months' experience of hook auctions in that country and also because adequate facilities to operate such auctions were in any event non-existent at the time at either of the two main centres of Salisbury and Bulawayo.

Government agreed however after examination of the profitability of beef production on a number of ranches, to increase the existing prices for cattle on the basis of the average return to producers by an amount of 15 per cent., opportunity being taken at the same time to make adjustments to the guaranteed price schedules to encourage production during the short supply period.

The Federal Government also accepted the recommendation of the Commission of Inquiry that a Federal Committee should be established to watch the marketing situation and to advise the Government on the movement of cattle and beef between the territories and to advise on the control of imports and exports and a non-statutory Federal Meat Marketing Committee consisting of producer and distributor representatives from Southern and Northern Rhodesia, together with a consumer representative and an independent chairman was appointed in due course.

It is as yet too early to draw any conclusions as to the probable effect on the cattle industry of the radical changes in marketing arrangements which have resulted from the implementation of the Commission of Inquiry's report.

Pigs. It is disappointing to have to record that the production decline in pigs which first commenced in October, 1954, has continued throughout 1956; however it appears from information collected during the year under review that the reduction in breeding stock has now reached a minimum level and that increase can be expected in future.

During the year, the Federation imported, mainly from the Union, a total of 679,000 lb. of bacon and 3,308 porkers. No less than 18% of the total sales of the standard lines normally produced locally have been covered by imports.

Despite a somewhat optimistic reference in the previous Annual Report to the possible implementation of a clear and definite policy for the pig industry, very little progress was made with the plans then under consideration for the re-organization of the processing and marketing side of the industry. However, towards the end of the year certain alternative plans and proposals for reorganization were under examination and there seemed to be every likelihood that these would prove acceptable to the industry as a whole.

If this indeed proves to be the case then it should not be long before the producer's confidence in the pig industry is fully restored and production brought into line with demand.

Milk. As previously mentioned this has been another record year for dairy production and over the 12 months ending on the 30th September, milk deliveries to the Dairy Marketing Board again showed an increase of over one million gallons, viz. 8,852,000 compared with 7,817,000 gallons in the previous year. Sales of whole milk have again increased though not to the same extent as production and a considerable surplus of milk was consequently available for conversion into cheese, manufactures of which have been more than sufficient to meet all local requirements for Cheddar.

A new price structure for milk supplied by producers to the Dairy Marketing Board and an increase in the consumer price of milk came into operation on the 1st January, 1956. Prior to this date producers enjoyed an arrangement under which they were guaranteed a monthly price for milk supplied irrespective of its utilization whereas under the new price structure the producer is guaranteed a standard price for milk consumed as whole milk plus a safety margin equal to 20% of that quantity whilst for all milk surplus to this total amount a manufacturing value of 1/9d. per gallon is paid.

Owing to the large quantity of surplus milk which has been available the average price paid to producers during the period January to September, 1956, exclusive of quality premiums amounted to 40.2d. per gallon as compared with the average price of 43.4d. per gallon — also exclusive of any quality premium — which was payable for all milk actually consumed as liquid milk plus the 20% reserve. Retail prices for milk from January, 1956, onwards were:—

	Cash	*Credit*
Undelivered milk per pint	6½d.	6¾d.
Delivered milk per pint	7d.	7¼d.

During the year the Board took over the last remaining Co-operative whole milk dairy in Southern Rhodesia, i.e. the Rhodesia Co-operative Milk Company, Bulawayo.

Further progress was made in obtaining a site for the new dairy which it is proposed to erect in Salisbury.

During the latter part of the year, the Federal Government assumed responsibility for the determination of milk prices in Northern Rhodesia, and immediately made alterations to the previously existing prices which were as follows:—

March to June	2/11d.
July to November	3/7d.
January, February and December	2/2d.

With effect from the 1st July, 1956, the following new prices were introduced:—

January, February and December	2/2d.
March to June and November	3/3d.
July to October	3/10d.

No differential producer price scheme operates in Northern Rhodesia.

During the 12 months under review a total of 1,433,388 gallons of milk was handled by the Co-operative Creameries of Northern Rhodesia.

The year has also seen increases in the consumer price of milk in Northern Rhodesia.

Poultry and Eggs. The poultry industry has now completely recovered from the setbacks it experienced a year or two ago. Sales from hatchers in Southern Rhodesia have been an all time record and the importation of day-old chicks into Northern Rhodesia has reached unprecedented levels. At the same time conditions on the egg market everywhere and on the table poultry market in Southern Rhodesia have remained completely stable. Production of eggs has been approximately adequate for Federal requirements and although neither imports nor exports have taken place,

neither have glut or shortage conditions manifested themselves. Two private enterprize concerns have interested themselves in the poultry market in Southern Rhodesia and one of these has set about the large scale pulping and chilling of eggs during the normal glut period to cater for periods of relative shortage.

Insofar as Northern Rhodesia is concerned, however, the production of table poultry continues to run very much below demand and although Southern Rhodesia might have been able to make up the shortfall with some kind of poultry, quality supplies have been limited. Importations of poultry in Northern Rhodesia have greatly exceeded 3,000 head per week. Many producers have now started to cater for this important table poultry market, but much remains to be done on the side of organizing transport and collection. The achievement of the private enterprize concerns already referred to is a most encouraging development in this connection.

REPORT OF THE DEPARTMENT OF RESEARCH AND SPECIALIST SERVICES FOR THE YEAR ENDED 30th SEPTEMBER, 1956

R. R. STAPLES

Director of Research and Specialist Services

A departure has been made in the presentation of the Annual Report of the Department this year. This first section is mainly a review of matters affecting the Department as a whole, and items of particular interest. The remaining sections cover in more detail the work of the various Specialist Branches and Research Stations as presented by their respective Heads.

Organization. Following the recommendations made in the Report of the Commission of Inquiry set up in 1955 to inquire into all matters relating to human and animal trypanosomiasis in Southern Rhodesia, the Branch of Tsetse Fly Operations has been expanded into a separate Department of the Ministry, with its own Director. This change in organization was effected on the 1st July, 1956. The organization of the rest of the Department of Research and Specialist Services remains the same although, with the expansion taking place, the time may be approaching when further re-organization in the Department may become necessary.

Staff. Mr. R. McChlery was promoted Deputy Secretary in the Ministry as from the 1st January, 1956, after serving the Department with distinction as its Director for a period of four years and two months. Dr. Oliver West, Officer-in-Charge Grasslands Research Station, was promoted to the vacant post of Chief Pasture Research Officer at Head Office, and Mr. H. D. L. Corby, Senior Agronomist, was selected to fill the vacancy created.

Additional posts created in the Department during the year were 3 professional officers' posts and 7 technical posts, and the total European establishment now numbers 192. Resignations totalled 27 and transfers to other Departments (Native Agriculture and Conservation and Extension) numbered 3. Officers recruited totalled 39. This represents an unduly high turn-over and considerable difficulty was experienced in recruiting, on the salary scales offered, suitably trained men, particularly in certain of the Branches.

Following the extensive upgrading of posts in the Territorial Service, dissatisfaction greatly increased regarding the grading of a number of posts which were generally considered to carry comparable responsibility before the Federal Service came into being. As the result a comprehensive inspection of the Department, together with the other Departments in the Ministry, was carried out by the Interim Federal Public Services Commission. Following this inspection 8 professional and 22 technical posts were upgraded. The salary scales and possibilities for advancement of the technical staff in the Department have now been put on a more satisfactory basis.

European Agriculture, Northern Rhodesia. As from the 1st January, 1956, European agriculture in Northern Rhodesia became a Federal responsibility. In the arrangements finally agreed to by the two Governments concerned, research stations and specialist agricultural services, as well as animal health, remained with the Territorial department. However, the numerous calls on the services of the senior members of this Department by the Department of Conservation and Extension were fully met and entailed a considerable number of visits to the European farming areas of Northern Rhodesia.

Departmental Conference. The second annual Conference of the Department was held in the newly completed hall of the Gwebi Agricultural College. The theme was "Maize Production" and the Conference was opened by the Secretary to the Ministry of Agriculture, Mr. J. R. Corry. In addition to the professional officers of the Department, a large number of representatives attended from the Department of Conservation and Extension, the Department of Native Agriculture, the Departments of Agriculture, Northern Rhodesia and Nyasaland, the Rhodesia National Farmers' Union, the Natural Resources Board and the Tobacco Research Board. The Conference was most successful and the papers presented are being published as a symposium on Maize Production; the publication will be a most useful addition to the literature on this subject.

Cotton Insect Pests. The Federal Standing Committee on Agricultural Production carried out a thorough investigation of cotton growing in the Federation. The Committee stressed that the main factor limiting cotton production under our conditions is the very severe damage caused by cotton insect pests and particularly the Red Bollworm. The recommendation was made that a team of three entomologists should be recruited to work on the problems of control and representations were made for assistance from the Colonial Development and Welfare Fund. Mr. E. L. Pearson the Assistant Director of the Commonwealth Institute of Entomology, and the foremost authority on African insect pests of cotton, was invited to visit the Federation and report on the position. He supported the Committee's recommendation and it has finally been agreed that the scheme will come into operation on the 1st December, 1956, financed equally by the Colonial Development and Welfare Fund, the Nyasaland Government and the Federal Government.

The success in bringing this scheme into being has been due to the close collaboration in the matter between the Nyasaland Department of Agriculture and the Federal Ministry of Agriculture, brought about largely through setting up the Federal Standing Committee previously referred to.

The cost of the scheme for the first three years is approximately £43,000. Two of the entomologists will be stationed at the Gatooma Research Station and the third in the main cotton growing area of Nyasaland.

Flora Zambesiaca. Financial arrangements for this important project were finalized during the year between the Colonial Office and the Government of Mocambique, Northern Rhodesia, Nyasaland and the Federal Government. Dr. H. Wild, the Senior Botanist proceeded to London early in July on extended secondment to Kew and the British Museum, and work on the production of the Flora is now on an active footing.

The project, which will take at least fifteen years to complete, involves an enormous amount of pains-taking work. With the rapid development taking place in the Federation, the need for an authoritative Flora for reference purposes is being increasingly needed by all Departments concerned with one of the major basic resources—the natural vegetation.

Irrigation Development in the Sabi Valley. The report on the first five years work of the Sabi Valley Experiment Station was published in January, 1956. This Station was set up to provide information on the behaviour of crops and soils under irrigation as the first essential step in the proposed large-scale irrigation scheme recommended for the Sabi Valley in the Alexander Gibb Report.

High yields of lucerne and cotton as well as from a number of other crops have been obtained at the Station. Wheat, an important crop in any large-scale irrigation development in the Federation, if we are to become self-sufficient in our rapidly increasing requirements of this commodity, was severely affected by rust in the last two seasons. However, with the appointment during the year of a Wheat Plant Breeder at the Salisbury Experiment Station and the development of a comprehensive selection and breeding programme with varieties obtained from many parts of the world, it is confidently anticipated that within the next few years high-yielding rust resistant varieties will be available for the Sabi Valley.

Maize Production. In Southern Rhodesia a record crop of maize was harvested in the 1955-56 season, not only in total production but in yields per acre. While the large crop produced, following four successive good seasons, has led to an embarrassing surplus of maize, the increased acre yields are gratifying as they can in large measure be attributed to the work of the Research Stations on hybrid maize and soil fertility problems.

The adequate use of nitrogen fertilizers combined with fairly high plant populations in the favourable rainfall areas, have consistently given marked increases in yields. On granite sands at the Grasslands Research Station, plot yields of 25 bags per acre were obtained without the addition of fertilizer, from land previously under a productive, well-fertilized grass ley. Where large applications of sulphate of ammonia are used, the necessity for periodic liming is becoming apparent. The results from these investigations have established quite clearly the possibilities, with nitrogen available at a reasonable price, for more intensive farming in the better rainfall areas of the Colony, even on poor granite sands of inherent low fertility.

The series of high rainfall years has drawn attention to the need for more work on problems of drainage on the extensive areas where the soils are not naturally well drained, if the very large productive potential from this class of land is to be developed more fully. Plans have been made to expand these investigations, in collaboration with the Department of Conservation and Extension, at the Grasslands Research Station.

Committees and Boards. The Director of Research and Specialist Services served on the following Committees and Boards:

(i) Federal Standing Committee on Agricultural Production (Chairman).
(ii) Federal Research Advisory Committee (Chairman).
(iii) Ministry's Research Advisory Committee (Chairman).
(iv) Sabi Valley Co-ordinating Committee.
(v) Committee on Hydrology.
(vi) Land Settlement Board.
(vii) Tobacco Research Board.

In addition the Director assisted the Inspectors of the Interim Federal Public Services Commission in their examination of the grading structure of the Departments of the Ministry.

Visits outside the Federation. Overseas study tours and attendance at International Scientific Conferences are essential if we are to keep abreast with the ever increasing progress being made in research work in the agricultural field. The Department was represented at the following Conferences and Meetings:

Meeting of the Interafrican Pedological Service, Yangambi, Belgian Congo, 1955.
Meeting of the Council of the International Red Locust Control Scheme, Pretoria, 1955.
S.A.R.C.C.U.S. Pasture Conference, Pretoria, 1956.
Quelea Control Conference, Dakar, 1955.

Hybrid Maize Conference, Potchefstroom, 1956.

International Seed Testing Conference, Paris, 1956.

International Soil Conference, Paris, 1956.

In addition, the Soil Physicist, Sabi Valley Experiment Station, left for the United States for a year's training under their I.C.A. assistance scheme; and several visits were made by officers of the Department to the Union in connection with specialised problems or studies.

Conclusion. Close co-operation was maintained with the Department of Conservation and Extension in serving the farming community with specialist advice, and with the many departments or organizations connected in any way with agriculture. Finally I wish to express my appreciation to all officers of the Department for their loyalty, willingness and enthusiasm shown during the year under review.

CROP PRODUCTION

T. K. SANSOM

Chief Agriculturist

Seasonal Conditions. The outstanding features of the season were the January drought in the Midlands and South of the country and the heavy late rains of the country as a whole. Record low rainfall totals were recorded in January and record highest in March and April. While rainfall totals for the season were good, the distribution of rain within the season was poor, there being too little when it was wanted and too much at the end of the season when a slackening off is needed.

The Maize Crop

Estimate of Yields. The Maize crop has shown a fairly steady expansion each year since the 1950-51 season, as the following table shows:

Season	No. of Growers	Area Planted	Crop Reaped	Yield per Acre
1950–51	3,916	343,521	1,176,528	3·42
1951–52	4,095	361,024	2,454,047	6·80
1952–53	4,176	363,204	2,360,011	6·50
1953–54	4,154	359,709	2,687,314	7·50
1954–55	4,170	364,059	2,734,920	7·51
1955–56 (estimated)	4,160	361,000	3,026,000	8·4

This expansion in production has been due to a succession of good rainy seasons, the use of hybrid seed and to improved farming methods. The final estimate for the 1955-56 crop is that 3,026,000 bags of 200 lb. net will be produced from 361,000 acres, which gives an average yield of 8.4 bags per acre for the whole Colony. This is the first time that the European maize crop has exceeded 3,000,000 bags. It would appear, however, that the above total is an underestimate as deliveries to the Grain Marketing Board and declarations by farmers of grain retained on farms give a total of between 3,300,000 and 3,400,000 bags.

Of this total Mashonaland is expected to produce 2,721,000 bags from 295,000 acres, which gives an average yield of 9.2 bags per acre compared with a total of 2,498,348 bags from 299,165 acres, giving an average yield of 8.35 bags per acre in the previous season.

The average yields of 8.4 and 9.2 bags per acre for the whole Colony and Mashonaland respectively are the highest average yields of any season since statistics of maize production have been taken. To illustrate how maize production methods have improved is shown by the fact that a considerable number of farmers now regularly reap from 20-30 bags per acre. Some farmers reap up to 40 bags per acre. These yields compare favourably with the best yields obtained in the Corn Belt of the United States of America, and the average annual yields of the four principal maize growing districts approximate those of Iowa and Illinois, the two principal corn growing states of the United States.

The Maize belt consisting of the Mazoe, Salisbury, Hartley and Lomagundi districts, is expected to produce 70 per cent. of the Colony's total maize crop or some 2,128,000 bags from 206,000 acres, which is only 57 per cent. of the total acreage under maize, or 1.85 bags per acre more than the average for the country.

The 1955-56 crop will supply all the Colony's requirements and there will be a considerable surplus to carry over. This surplus is now so large that attention has been given to the possibility of exporting maize.

Maize Grading and Moisture Testing. Only a few samples were submitted for moisture tests during the past season. The majority of these were sent by the Grain Marketing Board to check up on their own tests. In most cases it was found that check tests done by the Brown Duval method by this Department showed a lower moisture content than those done by the electrical resistance methods used by the Grain Marketing Board.

Southern Rhodesia Seed Maize Association

As in the past, the Southern Rhodesia Seed Maize Association and Government continue to employ two full-time Inspectors. The Association pays two-thirds of the Inspectors' salaries and Government contributes one-third and also the travelling expenses.

Final Report for the 1954-55 season. The area for the production of seed was 2,765 acres, which is 800 acres less than in the previous season. Fifty members produced for sale, two members had their whole crop disqualified.

The amount of seed sold, namely 22,335 bags of 200 lb. each, was the highest for any year during the seventeen years the Association has been in existence. This number is 2,935 bags more than that of the previous year and nearly 6,000 bags more than were sold for local use in 1953. This increase in sales was largely due to the carefully planned advertising campaign and to extra purchases made by commercial growers hit by the drought conditions during the sowing season. Although members were asked to retain 20% above their quota, only about half that amount was available when it was urgently needed.

On the whole the grain was of good quality and graded within the standards required by the rules of the Association.

Interim Report for the 1955-56 Season. Single hybrid seed sufficient to sow 3,439 acres was issued to members. This includes 209 acres grown for own use only, and 110 acres either voluntarily left unsown or disqualified; thus seed from 3,100 acres was available for sale. This represents an area of 335 acres more than was available last year. Crops in all districts have been good and it is reasonable to estimate that over 30,000 bags of seed could be found if required. Fifty-five members produced seed for sale, two were disqualified, however, leaving fifty-three growers whose seed is available for sale.

The improvement in grading of the seed which was noted last year has been maintained. There are still a few members, however, whose tests have indicated that they will have to regrade before their seed will reach the standard required. The present system of sending in samples of seed for the grading test, and a part of each sample being used for the germination test, is working satisfactorily.

The high quality of the seed produced by the majority of growers reflects the favourable weather conditions which prevailed during the growing season. With few exceptions every grower's seed was plump, and a large majority of the tests showed the germination to be 98% or over.

There has been a very keen demand for seed this season and by the 25th October of this year as much seed had been sold as was sold by the 25th November last year. Sales in Northern Rhodesia are already twice those for the whole of last year. A few members continue to market open pollinated seed of the varieties Hickory King, Southern Cross, and Salisbury White.

For the first time since the inception of the Association, membership has been extended to a Northern Rhodesian maize grower who will produce seed on probation for the requisite period of time before being allowed to sell it for commercial production.

Fifty-six members have applied for single hybrid seed for the production of seed for sale during the forthcoming season. The seed issued is sufficient to sow 3,413 acres which is 163 acres more than last year. Seventeen members have applied for seed to grow for their own use on 125 acres. This is a decrease of 79 acres compared with last year.

No seed has been sold to the United Kingdom or other European countries this season and it is unlikely that there will ever be any large sale to these countries, as much effort is being devoted there to breeding varieties specifically adapted to their own climatic conditions.

Membership of the Association. The following table gives a comparison between the 1955-56 season and previous seasons:—

Season	Total membership	Producing hybrid seed	Total acreage grown	Seed available for sale in bags of 200 lb. net
1948–49	57	40	350	1,774
1949–50	77	65	3,150	13,367
1950–51	91	69	3,275	17,226
1951–52	100	77	3,500	20,800
1952–53	96	80	3,113	20,500
1953–54	94	70	3,580	25,500
1954–55	90	68	2,765	25,000
1955–56	93	53	3,100	24,000

Hybrid Maize Farm. It is very pleasing to report that the Department has at long last been able to acquire a farm, to be devoted solely to the production of hybrid maize. The farm, Panmure, is situated seven miles from Shamva, and while the soil is not in the same category as the most fertile red soils, nevertheless it is considered to be sufficiently fertile for the production of single

hybrid seed and also the bulking up of inbred seed. Approximately 200 acres of the best soils on the farm can be commanded by irrigation by a canal from the Mazoe River and, together with the dry land available, there is sufficient to produce all the single hybrid seed required in the foreseeable future.

The buildings, both residential and storage, are adequate and are provided with light and power from the Electricity Supply Commission's distribution system. The range of implements is not adequate and will have to be added to very considerably.

During the past season as many lands as possible were green manured and will be planted for the production of single hybrid seed during the coming season.

Seed Maize Prices. There has been no change in the prices for seed maize during the present season, which remain as follows:—

Certified Double Hybrid Seed—Large Flats and Medium Flats	£5	10s.	0d. per bag of 200 lb. net
Certified Double Hybrid Seed—Large Rounds	£3	10s.	0d. per bag of 200 lb. net
Certified Double Hybrid—Smooth Rounds	£3	5s.	0d. per bag of 200 lb. net
Certified Open-pollinated Seed	£4	0s.	0d. per bag of 200 lb. net
Standard Open-pollinated Seed	£3	0s.	0d. per bag of 200 lb. net

At present only Certified Double Hybrid Large and Medium Flat seed is being sold by the Southern Rhodesia Seed Maize Association.

Wheat Production

Summer Wheat. Apart from experimental plantings little if any summer wheat was grown during the past season. There is considerable interest in summer wheat production on the part of farmers, but up to the present there is no variety which can be confidently recommended for sowing on a large scale.

Trial plots of wheat, embracing fertilizer and spraying trials for weed control, continue to be grown on the various Government Research Stations.

Winter Wheat. The 1955 winter wheat crop amounted to 10,732 bags. This is 1,283 bags less than the winter crop for the previous season, and represents only a fraction of the Colony's requirements. Figures for 1956 winter crop are not yet available but preliminary reports indicate that some 600 acres more than the previous season have been planted. An interesting development in winter wheat growing is its production in rotation with stubble mulched maize and/or tobacco in the summer, under spray irrigation. A fairly considerable acreage is grown in this manner along the Umfuli River.

At the Gatooma Research Station some trial plots were planted in April to ascertain whether it was possible to grow a crop of wheat during the winter in those areas where a high water table exists. The crop grew well and a yield of approximately 5 bags per acre was obtained. It is reported that one farmer reaped 8 bags an acre from a 30 acre field. The growing of a cereal crop during the winter after a season of heavy rainfall and consequent high water table offers considerable possibilities.

Wheat Breeding. With the appointment of a Wheat Plant Breeder in September of last year, a programme of summer and winter breeding experiments has been started. During the past summer 130 varieties, strains and selections were grown. From these a considerable number of further selections were made and a programme of hybrization was started. During the past winter 800 varieties, strains and selections and crosses were grown under spray irrigation and during the coming summer season the range of material will be still further increased.

It is confidently anticipated that within the next few years varieties will be available which will combine desirable characteristics with rust-resistance and also that wheat varieties which have been bred to stand up to the severe rust attack during the rainy season on the highveld will be still more resistant when grown during the winter in the lowveld such as the Sabi Valley.

Material for breeding purposes has been obtained from all over the world and there is a free interchange of material and ideas with the wheat Plant Breeder at the Mount Makulu Research Station near Lusaka.

Sorghum Production. There has been very little interest shown by farmers in the growing of grain sorghums in the lower rainfall areas during the past few years. This has been due to a continuation of a series of good rainy seasons which have been adequate for the successful production of maize. Nevertheless it is still considered that sorghum production in the drier areas over a period of seasons is a safer and a more profitable crop than maize, and work continues at the Matopos Research Station on the production of better varieties of sorghum of both grain and silage types.

Southern Rhodesia Seed Potato Association

Eastern Growers Association. The recommended potato scheme has now completed two growing seasons. Sixteen growers planted a total of 150 acres but the acreage passed for seed production was very considerably reduced due to bacterial wilt and eelworm infection. Over 3,000 bags were

passed for seed. The scheme has improved the standard of seed potatoes available and has checked the rapid spread of eelworm and bacterial wilt both in the Eastern districts and in the principal potato growing areas of the Colony. Two or more field inspections and one tuber inspection were made.

At a meeting held by growers of seed in Umtali in August last it was decided to continue the recommended scheme for the coming season. It is considered, however, that the time has now arrived when there should be a very close association with the Salisbury Area Potato Growers Association, members of which purchase by far the greater quantity of seed produced in the Eastern Districts.

Salisbury Area Potato Growers Association. This Association has now functioned for one season and already there has been an improvement in the quality of the seed produced. Members of the Association are in a different category compared with members of the Eastern Districts Association in that members of the latter Association can, in the course of time, it is hoped, produce seed equivalent to imported seed, whereas members of the former Association produce seed for the following main crop only.

Melsetter Pasture Sub-station. During the past season potato variety and fertilizer trials were conducted on the station. In addition foundation seed of Up-to-Date and S.S. seed of Pentland Ace were bulked up. These trials were conducted on a ploughed up grass/clover pasture which has been down for the past four seasons. In the variety trials some very high yields were obtained and several of the Dutch varieties which show field resistance to blight yielded at the rate of over 150 bags to the acre. The crop lifted from F.S. Up-to-Date, S.S. Pentland Ace and from the Dutch varieties has been distributed to selected members of the Eastern Districts Seed Potato Association.

A great deal of interest was shown in these trials by farmers in the Eastern Districts.

Potato Breeding. A potato breeder has recently been appointed. The appointment was made possible by the generosity of the Farmers' Co-op. Ltd., in subscribing £1,000 a year for three years for research in all aspects of potato production.

It is hoped that in the course of time, varieties will have been produced which are more specifically adapted to the conditions obtaining in this Colony than are imported varieties.

Miscellaneous Crops

Green Manure Crops. Legume green manure crops still continue to prove their worth and the demand for seed continues to be as great as ever. Unfortunately the two best crops, namely sunnhemp and velvet bean, suffer from a number of pests and diseases and the search continues for suitable substitute green manure crops. Considerable interest has been shown in the use of dahl or pigeon pea *(Cajanus indicus)* as a green manure crop. Various mixtures of legumes and non-legumes are recommended to farmers who are also advised to rotate their green manure crops and not plant the same legume year after year.

Dwarf Castor Bean. Owing to the non-availability of seed very little castor bean has been grown during the past season. Seed of several different hybrid varieties has been obtained from the Union of South Africa and will be tried out experimentally at the Matopos Research Station during the coming season.

Stubble Mulching and Trash Farming

A very great deal of interest has been taken by farmers in stubble mulch and trash farming especially in the production of the maize crop. Some farmers have produced four and five successive crops of maize without any apparent decrease in yield per acre, or build-up of disease infection such as *Helminthosporium.*

On other farms, however, and in experiments conducted on the Agricultural Experiment Station, Salisbury, there has been no doubt that the incorporation of maize stover in the soil has resulted in *Helminthosporium* starting in the stubble mulched or trashed plots and spreading to others.

The solution lies in the breeding of highly resistant strains of maize but, until such strains are produced, caution should be exercised in the excessive use of stubble mulching or trash farming in the production of maize; the introduction of a legume crop for hay in the rotation is suggested to prevent an undue build up of *Helminthosporium* infection.

General

Maize Breeders' Conference. The Maize Breeders' Conference this year took the form of a tour of all the principal research stations, where maize breeding is being conducted in the Union of South Africa.

The tour started in Pretoria, thence to Potchefstroom the Western Transvaal and Free State, Kroonstad, Bethlehem, Standerton and finally to the Agricultural Research Institute of the University of Natal.

The tour was of great educational value and every courtesy and assistance was received. It is hoped that the next Maize Breeders' Conference will be held in Salisbury to enable plant breeders in the Union to see the progress being made in this country and also to repay in some degree the kindness and hospitality accorded to this Department's officials.

Agricultural Shows. The Chief Agriculturist judged the maize, agricultural produce, and where staged, the district exhibit sections at the Umtali, Salisbury, Gwelo, Bulawayo, Livingstone and Lusaka Shows. The Senior Agriculturist, Matopos Research Station, judged these sections at the Fort Victoria, Bindura, Gatooma and Sinoia Shows. The standard of the maize exhibits at all shows was about the same as in previous years but there was an improvement in the standard of the agricultural produce exhibits.

Salisbury Experiment Station

The total rainfall for the season from October 1st until April 30th was forty inches, well above the seasonal average, and there were no dry spells of any consequence. The first germinating rain was a very heavy storm of four inches on November 25th, but prior to this fall a certain amount of dry planting of potatoes, maize and velvet beans had been carried out. A bad wind storm at the end of January was the cause of considerable damage to some of the maize plots; not only were many plants blown down but in some instances stalks were snapped. In the breeding nurseries careful records were made of the amount of lodging as a result of this storm.

Maize. The spray trial, designed to measure the effect of the leaf blight caused by the fungus *Helminthosporium turcicum*, provided further evidence of the necessity for breeding varieties resistant to this disease. The loss in yield was just over 30%, and almost identical to that sustained in the previous season's trial. This was from an attack which was rated finally at 3.5 (Beltsville scale). The provision during January and the greater part of February, of three supernumerary staff—undergraduates on their summer vacation—enabled a large numbers of selfs to be made in open-pollinated material of the three varieties, Hickory King, Salisbury White and Southern Cross. Only selected plants were selfed, and selection was on the basis of all the desirable agronomic charaters with particular emphasis on resistance to leaf blight. Sufficient development of the disease by pollinating time was ensured by hand inoculations carried out when the plants were young. Although many of the selfed plants were discarded at harvest time, either because the final rating for leaf blight was unsatisfactory or because of poor ear development, approximately 400 of these selfs will be carried forward. The season was noteworthy because of the extension of the breeding programme to include a yellow maize nursery. This was considered desirable for two reasons; first because in the event of the country wishing to export its surplus the demand will be for yellow maize, and secondly because many of the best sources of resistance to *Helminthosporium* in Natal are yellow lines. This work was carried out in semi-isolation at the southern end of the station. Some of the Natal material, white and yellow, showed considerable promise and will be carried forward in the breeding nurseries; of the American introductions the Mexican and Colombian lines appeared better adapted than the North American.

Six yield trial were laid down, the main object of which was to test representative lines from all inbred families, in an advanced stage, for specific combining ability with the single cross N3-1-4-9 x A5-7-6. Testing was in the form of three-way crosses; and twenty-six finally outyielded the tester parent, giving promise that they would combine with N3-1-4-9 x A5-7-6 to make double hybrids capable of yields at least no lower than this productive strain. Testing will be continued for a second season, after which the outstanding ones will be combined in a number of single crosses, and then in double crosses with N3-1-4-9 x A5-7-6 for further testing prior to release commercially.

In the fertilizer trials there was a significant response to phosphates in the long term experiment on block 13. Although there was virtually no difference between the yields from the different forms of phosphate, they were all four bags greater than the control, a larger response than usual, probably due to the cumulative effects of the treatments. Next season the new rotation will become effective and it may be that the response will vary with the preceding crop. The applications of fertilizer in this trial are calculated to supply the same total P_2O_5 as 300 lb. of superphosphate per acre.

YIELDS OF MAIZE (*in bags per acre*)

No phosphate	Rock	Supers	Bone Meal	Bat Guano
19·0	23·4	23·2	23·0	23·0

L.S.D. = 2·5 B.P.A.

On block 3, where the fundamental effects of leguminous green manures are being investigated, the mean response to phosphates (the immediate dressing to the 1955-56 maize crop was 300 lb. of supers per acre) was 11.7 bags per acre. This unusually large response can be attributed to the fact that the one series of plots has not received phosphates for over twenty years.

In the trial comparing single and double dressings of nitrogenous fertilizers at different stages in the growth of the second successive crop of maize after a leguminous green manure, there was

no significant difference between the response to sulphate of ammonia and nitrate of soda. The response to phosphates was significant only where the double dressings of 400 lb. of supers was applied, and the mean response to 150 lb. of potash was 4.9 bags per acre, the response being greatest in the presence of notrogen. The mean yields for the nitrogen treatments are tabulated below; there was a nitrogen potash interaction, the responses to the nitrogen being considerably higher in the presence of potash:

YIELDS OF MAIZE (in bags per acre)

A	B	C	D	E	F
16·9	20·7	22·5	20·8	23·2	22·8

L.S.D. (P = 0·05) = 1·7 B.P.A.

A = Control. No nitrogen.
B = 250 lb. S/A applied 6 weeks after planting.
C = 500 lb. S/A applied 6 weeks after planting.
D = 250 lb. S/A applied at planting.
E = 250 lb. S/A applied 6 weeks after planting + 250 lb. S/A applied at early tasselling.
F = 100 lb. S/A applied at planting + 200 lb. S/A at 6 weeks after planting + 200 lb. S/A at early tasselling.

The following were the yields obtained in the trial in which the object is to measure the effect of the removal of various parts of the plant:

YIELDS OF MAIZE (in bags per acre)

A	B	C	D	E	F	G
29·32	27·52	24·61	26·44	28·43	26·89	29·06

L.S.D. (P = 0·05) = 2·38 B.P.A.

A = Control.
B = Tassels + 3 top leaves removed at detasselling time.
C = Stalks cut above ears 15 weeks after planting.
D = Stalks cut above ears 18 weeks after planting.
E = Desuckered.
F = Plants cut and stooked 147 days after planting.
G = Plants cut and stooked 171 days after planting.

As in previous seasons, the removal of suckers, in this case rather less than one to every two plants, has not affected grain yields significantly. Cutting off the tops of the plants for ensilage, both at 15 and at 18 weeks after planting has lowered the yield significantly. Early stooking of the maize has had the same effect but to a lesser degree.

The yields from the stubble mulch trial were very similar to those obtained last season; but, although removing the stalks and replacing them with two tons of kraal compost per acre again outyielded all other treatments by two bags an acre, a comparison of yields for the two seasons shows that the treatments in which the stalks are left on the land have given improved results relative to those in which the stalks are removed.

Potatoes. Seventeen varieties were included in a replicated yield trial. The American variety, Kennebec, which gave the top yield in both the 1953-54 and the 1954-55 trials, this season occupied fourth place behind the three Dutch varieties, Voran, Dutch Robyjin and Alpha. Majestic, although lacking resistance to Late Blight, finished highest of the varieties from the United Kingdom and gave only two bags an acre less than Kennebec. In view of the fact that it was the variety chosen for the manurial trials it was extremely disappointing that Pentland Ace this season showed no resistance to blight and gave the lowest yield of all the varieties being tested. A number of additional varieties, of which insufficient seed was available to include them in the trial, were planted in observation plots. Tedria and Prinslander yielded well.

Groundnuts. The four leading varieties in the yield trial, planted on December 12th, were Indian Coromandel, Valencia, Virginia Bunch and 43 G 68 with yields of 29.93, 28.87, 27.82 and 26.68 bags of unshelled nuts to the acre respectively. Planted on November 30th, Valencia and Virginia Bunch yielded 30.08 and 29.93 bags to the acre, a smaller margin in favour of early planting than last year—possibly because late rains extended the growing season.

Soya Beans. Although in Rotation F yields were slightly higher than last year, in the variety trials they were on the average about three bags lower. This can be attributed to a difference in soil fertility, as, although both crops were grown after maize, this year the beans received artifiicials in place of a ten ton dressing of manure. The leading varieties, Nos. 107, 6 and 147 yielded 7.6, 7.3 and 6.9 bags to the acre. This is the first trial for several years in which No. 147 has failed to give top yield.

Sunnhemp. This year a factorial design was used for the fertilizer trial; but the growth was poor and there was no significant response to the dressings of either phosphates, potash or lime. Attempts were made to cross sunnhemp with other species of *Crotalaria* which are known to have greater resistance to disease. In many cases no seed was set and it will be seen this summer what types arise from the successful crosses.

Velvet Beans. Seed yields in the variety trials were a little lower than in the previous season, possibly due to an attack of a bacterial leaf spot early in January. The yields from the different varieties are tabulated:

WEIGHT OF SEED (in bags per acre)

Variety	5	11	14	16	18	42	52	77	J74	SOM
Season 1955–56 . . .	10·4	11·0	8·4	10·8	10·5	9·4	5·5	6·2	8·0	10·5
Mean of 5 seasons . . .	11·6	11·8	10·0	10·9	11·2	10·6	5·9	5·5	4·9	8·7

Wheat Breeding. With the appointment of a Wheat Breeder and the installation of a spray irrigation plant, both summer and winter crops were sown this year on the station. Of the varieties tested for summer conditions the Wheat Breeder considered the Kenya variety 261RF.G the most promising, and it will be bulked to allow seed to be issued to farmers. For the winter crop Punjab 8A is not yet replaceable; but when fertilized and manured to give yields above a certain level (about 14 bags) it lodges badly. A good source of resistance to stem rust is available and by crossing and selection it is hoped to obtain rust resistant varieties, with short, strong straw, capable of giving heavier yields than either of the varieties mentioned.

Horticulture

Horticultural production was well maintained although climatic conditions were the cause of extreme fluctuations of supply. Summer crops of vegetables were very scarce. Other production followed later in the season. Peach and plum crops were severely reduced due to late frost effects from the previous year.

While the Federation has a vast horticultural potential and growers continue to extend their plantings, careful consideration has to be taken not to produce beyond market requirements or the present means of distribution.

With less interest being taken in irrigated tobacco, several requests were received for alternative high-priced crops to utilize the existing lay-outs and irrigation equipment.

The canning factory at Cashel is being equipped with the necessary machinery and processing trial runs are expected to commence early in the new year.

Climatic Conditions. Good rains were experienced in all areas and continued until late in the season. Periods of overcast weather with high humidity and little sun made vegetable growing difficult and resulted in severe disease attacks.

Hail fell in November and caused considerable damage to fruit trees, fruit and vegetable crops. Only light frosts were experienced.

Citrus

Crops were fairly good but spring frosts the previous year caused later season blossoming and a large supply of late fruit.

While growers generally are aware of the need for trees to be given adequate amounts of nitrogenous fertilizers, it has become necessary to emphasize the importance of phosphate applications. Better quality fruit can only be obtained by a correct nitrogen phosphate ratio.

The shortage of nursery trees continued but supplies will soon be available from an Umtali nursery. Black Spot disease has limited the importation of trees from South Africa to those from the Cape Province.

A new citrus project was commenced in the Lundi Valley near Fort Victoria on a 4,000 acre pilot scheme and speedy development has taken place. The publicity this project received raised doubts among smaller growers as to the justification for extending their plantings. As many of these growers dispose of their fruit locally, and Africans are consuming increasing quantities of oranges and naartjies, there is justification for a more optimistic outlook.

The increased usage of the 30 lb. orange pocket, which is now almost universal, has stimulated sales and the marketing of more uniform quality fruit.

Production. Sales of S. Rhodesian citrus for 1954-55, including fruit used for processing by the Mazoe Citrus Estate, were:—

	Cases of 75–85 lb.
Oranges	226,546
Lemons	14,299
Grape Fruit	5,764
Other	5,512
TOTAL	252,121 (last year, 274,192 cases).

For the year 1954-55 the declared number of citrus trees in S. Rhodesia was:—

	Bearing	*Not Bearing*	*Total*
Orange	123,789	74,368	198,157
Lemon	17,007	4,454	21,461
Grape Fruit	8,074	2,898	10,972
Others	8,537	9,917	18,454
TOTAL	157,407	91,637	249,044

Last year's total was 230,786.

Sub-tropical Fruit

Increased plantings of all kinds of sub-tropical fruit has continued. Young trees benefitted considerably from the absence of frost.

Bananas. With approximately 300 acres of Cavendish bananas established in the Eastern Districts, present production accounts for about 20% of Southern Rhodesia's requirements. Much of the planting has still to reach bearing stage. Wholesale prices paid to local growers had to be reduced owing to increased competition from Portuguese East Africa.

More banana curing and ripening chambers were in use at Salisbury and Bulawayo. While higher quality fruit is being produced, blemishes are still high and greater care in handing and in transit is essential to reduce losses in ripening.

Pawpaws. Markets were able to absorb more better quality locally-produced fruit which is readily grown in many areas. To improve distribution, more use of standard size non-returnable boxes is desirable.

Avocados. Although increased planting was recorded, the short supply of budded trees limited expansion. Hail completely defoliated an orchard at Melsetter and shading of the trees was necessary to avoid sun scalding of the bark.

Pineapples. Commercial plantings increased but these were too young to have any appreciable effect on fruit supplies. Much experimentation is necessary with pineapple growing in Rhodesia in order to guide growers on precise standard cultural practices.

Guavas. The canning factory continued to absorb local fruit from seedling grown trees. More interest was taken in the propagation and planting of S. African named varieties with higher vitamin content.

Granadillas. Larger quantities of fruit have been produced during the past year. With the plentiful supplies of juice arriving in quantity from Nyasaland more local fruit will be marketed for fresh fruit consumption.

Sub-tropical fruit trees (excluding citrus). For 1954-55 the recorded total of trees in S. Rhodesia were:—

	Bearing	*Not Bearing*	*Total*
Pawpaws	17,802	9,634	27,436
Mango	16,418	6,275	22,693
Avocado	3,210	4,073	7,283
Guava	12,075	4,321	16,396
Other	1,419	1,456	2,875
TOTAL	50,924	25,759	76,683

Deciduous Fruit

Due to there being little or no winter frost for the past two years, the effect of lack of winter chilling (which causes delayed spring foliation) was more severe than ever. This physiological trouble clearly indicates the need for greater discrimination in the choice both of varieties and orchard siting.

The commercial usage of dinitro-ortho-cresol oil as a dormant spray—applied six weeks before blossoming—has proved most satisfactory and economic for apples and plums in promoting more normal growth and even periods of blossoming.

Fruit crops were light and sold readily. It was unnecessary to impose seasonal permit control of apple and plum importation from South Africa.

Fruit Growers' Associations were formed at Inyanga and Umtali for the collective marketing of fruit. This effort met with much success and is being continued. Improved quality, packing and presentation of fruit was achieved.

Bitter rot disease (*Glomerella*) of apples is still causing serious fruit losses in the higher rainfall areas of the Eastern Districts. Special spraying is being carried out. Some "heat scald" of Beauty and Shiro Smomo plums occurred, both being susceptible varieties.

Deciduous Fruit Trees. The recorded totals for the year 1954-55 were:—

	Bearing	*Not Bearing*	*Total*
Apple	26,324	39,812	66,136
Peach	29,576	26,221	55,797
Plum	10,083	10,054	20,137
Pear	2,347	5,929	8,276
Apricot	2,805	4,356	7,161
Quinces	5,026	2,805	7,831
Others	3,303	19,430	22,733
TOTAL	79,464	108,607	188,071

The previous year's total was 174,606 trees.

Fruit Importation. Importation of fruit is still very considerable but it is considered that greater local production is possible together with improved organization for distribution. Federal imports for 1955 were:—

Citrus	£14,562
Sub-tropical	£101,922
Deciduous	£216,544
Grapes and Miscellaneous	£69,424
TOTAL	£402,452

Grapes. Good growth was obtained in trial plantings in several areas and the small crops produced gave favourable indications of the possibilities for local production of early varieties. Many inquiries were received for information on grape growing.

Strawberries. Improvement was effected in the selection of plants for propagation but mild virus disease infestation is still common.

While the new high yielding varieties from the Western Province Fruit Research Station, Stellenbosch, grew and cropped well, the fruit was very subject to sun scald and the flavour was not as good as from fruit of local varieties.

Coffee. The small plantings of coffee in the Eastern Districts cropped well and are being extended.

Vegetables

During the past year the commercial vegetable acreage increased to 3,866 (1954—3,534) and kept pace with requirements. Production difficulties and shortages during prolonged summer rains were followed by very plentiful supplies during winter and spring; frost damage was negligible.

Black Rot disease *(Xanthomonas)* of the cabbage family was very common and widespread. Cauliflower crops suffered in varying degrees from molybdenum deficiency especially the popularly grown variety Early Snowball. Growers were advised to apply sodium or ammonium molybdate to the seed beds followed by one field application, which gave good results.

Vegetable Imports. Fresh vegetable imports into the Federation for 1955 were 2,784 tons valued at £75,500. Losses of summer crops were responsible for the bulk of this importation.

Production and Processing. Some improvement took place in the planning of production so that a better continuity of supply could be obtained. Production of vegetables in the Umtali area for processing greatly increased.

Poor quality and lower yields of vegetables occurred on some small holdings due to the loss of animal manure resulting from the decline in pig-keeping.

Onions. The returns of the acreage planted to onions in 1955, was 272 acres and a crop of 15,890 bags of 120 lb. The reduced acreage of the previous year has now been halted following the protection afforded growers by the control of imports during September to January inclusive. A marked improvement in cropping and handling has taken place. Imports for 1955 were 45,000 bags valued at £82,000.

Seed production. Interest has been maintained with good results in vegetable seed production. Of the several varieties grown, lettuce seed constituted the bulk of production. Export markets for large quantities of good quality seed are available; a seed inspection service has therefore been provided by the Department. Seed exported was valued at £1,484.

Nursery Planting Material. Federal importations of horticultural trees, shrubs, plants, bulbs and tubers for 1955 were valued at £47,392. This continual increase is due to local nurseries buying stock instead of doing most of their own propagation. Practically all the deciduous fruit trees and most rose bushes were imported.

Miscellaneous

Advisory Services. With the continued increase in the number of growers and greater interest taken in horticulture, requests for all kinds of horticultural advisory services increased very considerably. The limited staff available found it difficult to deal with all requests.

Many horticultural lectures and demonstrations were given in various areas; lectures on fruit and vegetable growing were given to senior students of the Gwebi Agricultural College.

Visits were paid to fruit and vegetable growers at Ndola, the Copper Belt area, Lusaka and Livingstone on behalf of the Department of Conservation and Extension.

Agricultural Shows. The Senior Horticulturist judged fruit, flowers and vegetables at agricultural and horticultural shows held at Sinoia, Inyanga, Livingstone, Bulawayo, Salisbury and Gwelo, and also the finals of the Young Farmers' Club competitions. Educational exhibits were staged at the Inyanga and Salisbury Shows.

Rhodes Inyanga Orchards

Climatic Conditions. Rain was recorded on 136 days and totalled 49.25 inches. Distribution was good. Sunshine averaged 7.5 hours per day over the year. A severe hailstorm occurred on 25th November and considerable damage was caused to fruit trees and fruit.

Fruit Crop. What would have been a good apple season was completely upset by hail. All fruit was hail blemished and could only be sold as such. Of the fruit sold, apples realized £1,141 of the £1,368 total. Fruit was marketed through the Inyanga Fruit Growers' Association.

Fruit Trees. All trees suffered considerably from hail. Some lost 20% of their foliage and the remaining leaves were torn and split. Bark was badly lacerated and growing tips of shoots broken. All nutritional spraying experiments for the year were a complete failure as no interpretation of results could be made, due entirely to hail damage which masked all responses.

It was necessary to grub out 500 old apple trees in two orchard blocks as they were serving no useful purpose. The land is being fallowed. New plantings were made in rested land.

Variety Trials and Introductions. The clingstone peach variety orchard again proved the superiority of growth and cropping of the Kakamas variety. A portion of this orchard is irrigated to compare this practice with dryland cropping, but no conclusive results have yet been obtained. An unnamed peach variety resembling Elberta has cropped well whereas Elberta is totally unsuitable.

New variety introductions of apples made promising growth and some early cropping results are expected. Winter Banana apple has proved most suitable. Of the older apple varieties Rhode Island Greening is the most consistenly good yielder. Much of the fruit is parthenocarpic. Red Bartlett pear scions were imported from U.S.A.

Tree Nutrition. Experiments are being intensified to overcome nutritional difficulties. A nitrogen-magnesium experiment was laid down in Blocks Nos. 5 and 11.

Pests and Diseases. Pest troubles were very light and no major attacks were experienced. "Bitter Rot" disease was not serious. Apple mildew was more widespread than usual owing no doubt to less humidity than usual in early summer. Spraying and dusting experiments are being carried out.

General

Pollination and yield recording work was continued. Soil management studies of clean cultivation, summer cover cropping and permanent sod were extended. Further analyses of cider apple varieties for sugars and acidity show that they are of the same basic composition as when grown in Europe. Some nursery fruit trees were issued to Government Stations for trial.

ANIMAL PRODUCTION

J. C. RAATH
Chief Animal Husbandry Officer

The year under review was a favourable one for cattle production. Rainfall was adequate and well distributed. Cattle maintained fairly good condition during the dry season.

The Cattle Industry

Below are given figures for the European owned stock over the last five years:—

Year	*Total Number*	*Number Of Cows*	*Number of Calves*	*Total Deaths*
1951	1,154,860	377,673	178,088	56,055
1952	1,199,576	400,918	188,825	54,715
1953	1,196,570	411,829	192,788	62,486
1954	1,227,066	430,071	207,196	57,251
1955	1,246,254	449,306	206,746	65,043

An increase of 1.6% was recorded in European-owned cattle at the end of 1955. Breeding cows again showed an encouraging increase, but in calf numbers there was a slight reduction in comparison with the previous year. Deaths remained at a low level and no improvement took place in the average reproduction rate. Encouraging results are being obtained from feeding experiments to improve calving rates.

Supplies of slaughter stock. The following table indicates the supplies of slaughter stock and the average cold dressed weight of cattle over the past five years:—

Year	*Total Number of Cattle Slaughtered*	*Average c.w.d. lb.*
1951	234,105	415
1952	238,944	413
1953	227,923	423
1954	256,271	423
1955	259,666	420

A small increase took place in the total number of cattle slaughtered during 1955. As a result of a continuation of good seasons it was possible to maintain a relatively high slaughtering rate. During the latter part of the 1956 summer period producers were inclined to hold back cattle in anticipation of a rise in prices. This build-up of cattle together with the good season resulted in sufficient cattle coming forward to supply the demand during the scarce season, so that rationing, except for a period for lower grades, was not necessary.

Prices of slaughter cattle. A Commission of Inquiry into the marketing of beef, under the Chairmanship of Sir Henry Turner, was appointed during the year. As a result of its report radical changes were made in cattle marketing in Southern Rhodesia. Practically all controls on marketing were abolished. Cattle buying and slaughter permits were no longer required and controls on retail meat prices were also lifted. Producer prices of cattle were increased by 18.6%, of which 15% was granted as a special incentive to stimulate production, the balance of 3.6 represented the increase in cost of production. Substantial changes were made in the price schedule resulting in a narrower margin between the different grades and a greater difference in prices between the flush and off season. All producers were allowed the free choice of selling their stock to the Cold Storage Commission at fixed prices or on open auction sales. Because of the nature of the local demand and support from the Cold Storage Commission, the changes in the method of marketing have so far resulted in relatively high prices for the lower grades of beef. It is doubtful whether this demand for the lower grades is a true reflection of what the majority of consumers would purchase. The largest proportion of beef is consumed by Africans. Their supplies are purchased by employers through retailers and employees are not given the opportunity of selecting their own meat and so indicate their real preferences.

Grading of beef for local consumption. Grading of beef and pigs was carried out at Bulawayo, Salisbury, Umtali, Fort Victoria, Gwelo and Gatooma and the number of cattle in the various classes and grades were as follows:—

Grade	Oxen	Cows	Bulls	Calves	Total 1956	Total 1955
Rhodesia Best	3,442	221	—	—	3,663	3,799
Imperial	11,257	451	—	—	11,708	12,706
Standard A	36,257	2,269	—	—	38,526	46,980
G.A.Q.	30,136	19,842	—	—	49,978	50,437
F.A.Q.	8,418	6,953	—	—	15,371	18,585
Compound	8,482	7,449	2,114	—	18,045	25,215
Inferior	1,674	4,198	235	—	6,107	9,638
Calves	—	—	—	6,712	6,712	6,929
TOTAL 1956	99,666	41,383	2,349	6,712	150,110	174,289
TOTAL 1955	118,571	46,503	2,286	6,929	—	—

For comparative purposes the numbers in the various grades obtained in 1955 are also given. The total number of cattle killed at all grading centres has decreased by 24,179 head. Private butchers have killed 4,365 head more, and the Cold Storage Commission 28,541 head less than in 1955. The decrease in slaughterings was possibly due to a build up of cattle prior to the 1st June, 1956. Producers held cattle back in anticipation of a price increase. All these cattle could not be absorbed by the Cold Storage Commission during the four months following the coming into effect of the increased prices on 1st June, 1956. It is not possible at this stage to indicate with any certainty whether any reduction in consumption has taken place which may be partly responsible for the decrease in slaughterings.

Important changes were made in the retailing of beef. The previous system of selling beef in only two retail grades was abolished. All producer grades except Inferior were marked differently so that they could be identified by consumers.

The following schedule indicates the different producers and consumer grades and the numbers and percentage of each grade slaughtered by the Cold Storage Commission and private butchers:—

Producer Grade	Consumer Grade Mark	Numbers and Percentages of each Grade slaughtered			
		C.S.C. Number	C.S.C. %	Private Number	Butchers %
Rhodesia Best	Super	3,590	2·93	73	0·35
Imperial	Choice	10,878	8·88	830	3·96
Standard A	Standard	33,744	27·56	4,783	22·84
G.A.Q.	3	42,982	35·10	6,995	33·40
F.A.Q.	4	12,281	10·02	3,090	14·75
Compound	X	13,974	11·41	4,071	19·44
Inferior	X	5,005	4·10	1,102	5·26
		122,454		20,944	

The new retail system was only in operation for the last four months of the year but sales indicated that there was a fairly consistent demand for the higher grades of beef since decontrol came into operation, particularly in the Salisbury area. It was however, still necessary for the Cold Storage Commission to sell the higher grades of beef considerably below their buying price.

Stall feeding. Only small numbers of cattle were stall fed during the year. Producers were still generally of the opinion that the financial returns involved were not sufficiently attractive. The declared policy of the Cold Storage Commission not to freeze beef, particularly the higher grades, may result in more producers maintaining cattle for delivery in the off season. Higher prices during the off season may encourage the feeding of cattle if returns prove to be more attractive than in the past.

Slaughter of immature and breeding stock. A total of 2,541 immature male stock and 1,977 potential breeding stock was slaughtered at the Cold Storage Commission depots, representing an appreciable increase on previous years, particularly in breeding stock.

Pigs

The following table gives the number of pigs owned and slaughtered over the past five years:—

Year	*Pigs Owned*	*Pigs Slaughtered*
1951	48,987	62,908
1952	64,015	77,968
1953	74,113	106,088
1954	64,090	121,212
1955	53,187	110,260

The European-owned pig population again showed a considerable decrease in numbers at the end of 1955. This resulted in a further decrease in pig production, as reflected by figures for slaughterings at the grading centres during the present year given below (under grading). Information collected during the present year seem to indicate that the reduction in breeding stock has now possibly reached a minimum level and that a moderate increase can be expected in future unless any unexpected difficulties are encountered.

The high cost of feedstuffs is a major obstacle to expansion in the industry. Producers require more individual attention and advice on feeding and management and the use of home-grown feeds to reduce costs.

Grading of Pigs. A total number of 86,514 pigs were graded during the year at all grading centres, divided into the following grades and classes:—

PIGS SLAUGHTERED FOR COLD STORAGE COMMISSION:

Baconers	Numbers	Porkers	Numbers	Cutters	Numbers
Grade A	26,537	Grade A	9,285	Grade A	3,310
B	3,858	B	1,724	B	567
C	627	L	201	L	134
L	1,838	X	2,594	X	1,618
X	2,539	Inferior	370	Inferior	91
Inferior	201				
TOTALS	35,600		14,174		5,720

Underweight Pigs	Numbers	Overweight Pigs	Numbers	Manufacturing Pigs	Numbers	Boars	Numbers
Grade B	621	Grade B	186	Grade A	2,250	Grade A	78
L	27	C	7	B	334	Inferior	48
X.	174			Inferior	308		
Inferior	275						
TOTALS	1,097		193		2,892		126

PIGS SLAUGHTERED FOR BUTCHERS

Porkers	Numbers	Cutters	Numbers	Overweight Pigs	Numbers
Grade A	4,864	Grade A	504	Grade B	879
B	797	B	125	L	1
L	28	L	25	X	707
X	8,323	X	3,082	Inferior	1,012
Inferior	3,055	Inferior	3,310		
TOTALS	17,067		7,046		2,599

A considerable decrease in pigs slaughtered at the different grading centres from 95,895 to 86,514 was recorded. It was not possible to compare the numbers in the various classes and grades with previous years because of major changes in the grading system.

The grading system which came into operation on the 1st October, 1955, met with certain difficulties and objections and in order to eliminate these, further modifications were made and a new schedule of grades and prices was introduced on 16th April, 1956.

Increases were made in maximum and minimum prices to allow for adjustments to be made within the price range due to changes in the cost of production of pigs. The present maximum and minimum prices in the various grades and classes are as follows:—

Grades and Class.	*Minimum Price per lb. c.d.w.*	*Maximum Price per lb. c.d.w.*
	s. d.	s. d.
1. UNDERWEIGHT PIG:		
Grade B	1 7	1 10
Grade L	1 2	1 5
Grade X	10	1 1
Inferior	7	9
2. PORKER, 55–100 lb. c.d.w.:		
Grade A	1 8½	1 11½
Grade B	1 7	1 10
Grade L	1 2	1 5
Grade X	10	1 1
Inferior	7	9
3. CUTTER, 101–110 lb. c.d.w.:		
Grade A	1 6½	1 9½
Grade B	1 5	1 8
Grade L	1 1	1 4
Grade X	10	1 1
Inferior	7	9
4. CUTTER, 111–124 lb. c.d.w.:		
Grade A	1 5	1 8
Grade B	1 3	1 6
Grade L	1 0	1 3
Grade X	10	1 1
Inferior	7	9
5. CUTTER, 125–134 lb. c.d.w.:		
Grade A	1 7	1 10
Grade B	1 5	1 8
Grade L	1 1	1 4
Grade X	10	1 1
Inferior	7	9
6. BACONER, 135–180 lb. c.d.w.:		
Grade A	1 10½	2 1½
Grade B	1 6½	1 9½
Grade C	1 3	1 6
Grade L	1 5	1 8
Grade X	10½	1 1½
Inferior	7	9
7. OVERWEIGHT PIG (Good), 181–190 lb. c.d.w.:	1 4	1 7

MANUFACTURING PIGS:

(*a*) Sows and Others:	*Minimum price per lb. c.d.w.*	*Maximum price per lb. c.d.w.*
Grade A	1 11½	1 2½
Grade B	9	1 0

Note: Seedy cut: In respect of all carcases, graded as Underweight B and L; Porkers A, B and L; Cutters, A, B and L; Baconers, A, B, C and L; and Overweight Pigs (good) which contain seedy cut to the extent of reducing the value of the carcase, the amount of minimum and maximum prices will be reduced by 1d. per lb. c.d.w.

Sheep

The following table gives the number of sheep owned and slaughtered as well as the mortality in sheep over the past five years:—

Year	*Sheep Owned*	*Sheep Slaughtered*	*Deaths*
1951	116,056	49,914	10,247
1952	115,588	54,021	20,698
1953	105,970	52,308	17,444
1954	108,574	47,452	11,912
1955	106,483	36,319	13,665

Sheep numbers showed a slight decrease during the year. Considerable quantities of mutton and lamb were imported during the year from New Zealand. These supplies could easily be produced locally if more interest in sheep production can be stimulated.

General

Close co-operation was maintained with the Extension and advisory services and numerous visits to farms were made to give guidance on livestock problems. One senior Animal Husbandry Officer was appointed to Northern Rhodesia to advise on livestock production and one similar additional post was created for S. Rhodesia. These appointments will greatly assist in providing more assistance to the advisory services on specific animal husbandry problems.

POULTRY

G. H. COOPER
Chief Poultry Officer

The season has again been favourable for poultry producers. Stock numbers have increased and prices have been satisfactory in spite of increased costs; however improved efficiency in production is becoming more essential.

Marketing and Organization. The National Poultry Council of the Rhodesia National Farmers' Union only met once during the year and a Committee of three, consisting of the Chairmen of the National Poultry Committee and the National Poultry Council together with a Northern Rhodesia representative, was formed with authority to deal with poultry matters on behalf of the National Poultry Council for submission to the Rhodesia National Farmers' Union Council. This was done to save expense.

The above Committee, to meetings of which the Chief Poultry Officer is always invited, has met twice, but as there have been no problems of importance brought forward and the season has been satisfactory, there is little to report. The Committee has put forward proposals to this Ministry in respect of voluntary grading of eggs for retail sale, which have been sent to the Federal Marketing Council for examination.

The Customs agreement with the Union of South Africa safeguards producers of poultry products in the Federation and appears to be working satisfactorily. However, as it is hoped the Federation will gradually become self-supporting in table poultry, this commodity should disappear from the import list. The same applies to day old chicks. Both these products and a few eggs are only imported into Northern Rhodesia and it is expected the necessity for importation will cease by 1958 at the latest.

The stocks of egg pulp held by the Cold Storage Commission for several years are at last exhausted, though over 100,000 lb. weight was sold during the year and consequently has affected sales of this season's eggs to that extent.

Stocks of egg pulp amounting to some 4,000 tins (40 lb. each) are expected to be stored during this season, but as processing is at its height at this date (October) it is not possible to state what quantity will be produced. I estimate a figure not over 3,000 tins as prices are rising and it will shortly not be profitable to pulp. This business is being undertaken by a firm in Salisbury and it is

drawing eggs from as far as Bulawayo. The pulp should all be sold between January and June, 1957, to bakers and should not affect the sales of shell eggs or the prices.

The extra demand for all poultry products, due to the influx of workers at Kariba and also the continued immigration into the Federation, may result in a shortfall in supplies in spite of expected increased production in 1957. The general outlook, however, is that satisfactory supplies and prices of both eggs and table poultry will be forthcoming.

Egg Prices. The seasonal fluctuation in prices followed the usual pattern, but the higher priced period was more prolonged than usual and thus the overall price for the year was slightly higher than for 1955, though the highest and lowest figures obtained were the same to producers. The average retail price was 4s. 4d. per standard dozen in Salisbury for the year, with somewhat lower prices in Bulawayo and higher in Northern Rhodesia. This constitutes a four per cent. rise on the 1955 price.

This price is satisfactory to producers in spite of increased feed costs but the margin is becoming narrower, especially for farmers who have transport charges on both feed and eggs to meet. Thus greater efficiency in production will be required. Attractive packaging of eggs and sales from self-service stores has increased consumption and the general trend in this direction is encouraging.

Table Poultry. The interest shown in this side of the poultry business has continued throughout the year and the increased prices of beef and other meats has resulted in a greater demand for poultry, the price of which has not advanced to the same extent. Provided feed costs do not rise further and retailers do not demand a higher percentage profit, the strong demand for poultry should increase; with a larger turnover the business should be attractive to farmers.

The demand for the small "broiler" type of chicken continued and prices have risen slightly to 3s. 6d. and 3s. 9d. per lb. dressed. These are sold at 4s. 3d. to 4s. 6d. retail. Live weight prices have been steady at 2s. 3d. to 2s. 6d. per lb. for this class of bird, and 1s. 9d. to 2s. 0d. for culls and older stock. The prices for turkeys have also risen to 3s. 3d. per lb. live weight and up to 5s. 6d. for dressed birds.

Statistical figures show a slight drop in the sales of table poultry but a rise in value. As a large quantity of the table birds are produced on small holdings these figures do not reflect the true position.

A firm with strong overseas connections has established a processing plant for poultry in Bulawayo, with cold store facilities in the course of erection in Salisbury. This is welcomed and should result in improved distribution, enabling the movement of stocks from Southern Rhodesia to Northern Rhodesia where the demand at present is largely met by imports.

Production in Northern Rhodesia is also expanding, chiefly on small holdings, and it is obvious there are excellent prospects there for local production.

Most table poultry produced near the larger consuming centres is processed on the farm, but the work is unpopular, though it is profitable; for this reason and also for the benefit of farmers further from markets who have to sell live weight, a processing plant in Salisbury in particular and at other centres is urgently required. It is hoped either a co-op. will be formed or private enterprize encouraged to set up such plants.

Imports. The following table gives details of the Imports of poultry products for the Federation from August, 1955, to July, 1956, inclusive:—

IMPORTS OF POULTRY PRODUCTS

Article and Country of Origin	Quantity	Value £
Poultry, live:	No.	
United Kingdom	1,268	234
Denmark	1,800	343
Union of South Africa	62,562	6,633
TOTAL	65,630	7,210
Poultry, dressed:	lb.	
Union of South Africa	343,917	52,297
Bechuanaland Protectorate	27,136	1,353
United Kingdom	1,264	502
Tanganyika	56	8
TOTAL	372,373	54,160
Eggs in shell:	dozen	
Union of South Africa	7,180	997
Tanganyika	234	46
Bechuanaland Protectorate	3	1
United Kingdom	45	37
TOTAL	7,462	1,081
Eggs, liquid or dried:	lb.	
China	32	24
Union of South Africa	570	447
Sweden	112	93
TOTAL	714	564

Imports consist almost entirely of day old chickens and dressed table poultry from the Union of South Africa consigned to Northern Rhodesia. Permits to import 1,000 turkeys for Christmas are the only ones required in Southern Rhodesia. Both these commodities are under import control and only bare requirements are allowed entry. Quotas have been placed on imports to encourage local production and it is hoped to be able to supply the demand by 1958. However, as the market for both chicks and table birds is expanding rapidly all over the Federation as well, it may be longer than expected before all requirements are met without import.

Some importation of chickens from the United Kingdom and Denmark for breeding purposes took place, as will be seen from the table.

Exports

EXPORTS OF POULTRY PRODUCTS

Article and Country of Destination	Domestic Produce		Re-exports	
	Quantity	Value £	Quantity	Value £
Poultry, live:	No.			
Kenya	14,560	2,395	—	—
Tanganyika	4,415	747	—	—
Belgian Congo	2,756	246	—	—
Mocambique	5,280	504	—	—
Bechuanaland Protectorate	920	149	—	—
Union of South Africa	4	4	—	—
TOTAL	27,935	4,045	—	—
Poultry, dressed:	lb.			
Mocambique	81	17	—	—
TOTAL	81	17	—	—
Eggs in shell:	dozen			
Mocambique	4,651	904	—	—
TOTAL	4,651	904	—	—
Eggs, liquid or dried:	lb.			
United Kingdom	8	2	—	—
Union of South Africa	22	6	—	—
TOTAL	30	8	—	—

The principal export is in day old chicks to neighbouring territories from Southern Rhodesia. This business is expanding and will, it is hoped, in time become an important means of revenue for breeders. Costs of production being higher than in South Africa however gives that country a distinct advantage in competition for this trade. The same applies to table poultry, in which a small trade with the Congo is developing.

Numbers of Poultry, Poultry Products Sold, and Value, in 1955. The numbers of poultry as at 30th September in 1954 and 1955 were as follows:—

Class	1954	1955
Fowls	512,955	527,878
Ducks	23,695	23,905
Geese	2,299	2,766
Turkeys	16,971	17,630
TOTAL POULTRY	545,920	572,079

The total number of poultry increased slightly in 1955; the main increase was in fowls.

The following table shows the number of producers and total number of poultry kept, by groups:—

Group	Number of Producers	Number of Fowls
Under 100	2,416	91,679
100–249	519	75,936
250–499	166	56,496
500–999	90	61,515
1,000 and over	114	242,252
TOTALS	3,305	527,878

The number of farmers rendering returns was 3,305, a drop of 79 on 1954. The main drop is in the group of producers having under 100 birds, whereas the number in the groups 500 to 1,000 has increased, thus indicating that the small flocks are becoming less profitable.

POULTRY PRODUCE SOLD DURING YEAR ENDING 30TH SEPTEMBER, 1955.

Commodity	Quantity	Value £	Increased Value £
Hen's eggs sold	1,817,173 dozen	283,632	18,000
Table Poultry sold	583,458 lbs.	81,864	6,000
Day old chicks sold	560,444	48,475	1,000
Other live poultry sold	30,541	7,907	—

The figures quoted here refer only to those producers rendering returns and therefore do not represent the whole industry.

Poultry Feeds. Since the removal of price control on farm feeds in July, 1955, prices of poultry feeds have risen 7½ per cent. due to increased cost of imported protein feeds, chiefly fish meal, and the increased price of maize. The high cost of basic feedstuffs, particularly maize, encourages the use by manufacturers of maize offals such as bran, which is practically useless for poultry feeding. As there is definitely a ceiling, due to consumer resistance, at which eggs can be sold, the continued rise in the price of feed, which is responsible for about seventy per cent. of the production costs, is causing anxiety and doubt in the industry. If a suitable feed grain such as munga was more cheaply available it would greatly assist stock feeders in keeping down their costs of production, though this grain is not liked by millers, and is more expensive to grind to meal.

Owing to the non-availability of yellow maize, in Mashonaland particularly, vitamin A deficiency in poultry is encountered and the price of feeds is increased owing to the necessity to use synthetic vitamin supplements more freely. Increased production of yellow maize would benefit poultry.

In certain respects improvement in poultry feeds is noticeable as stabilized vitamin products have become available and greater attention is paid to the new knowledge of the nutritional requirements of poultry. In general, feeds used for poultry, with the exception of munga, have been readily available during the year.

Poultry Section: Gwebi College

The work at this station has again been upset by staff changes as the present Lecturer in Poultry, who only assumed duty in November, has been on military training since July and therefore, in the nine months he has been at the College, has had no time to devote to anything but student instruction, consequently no experimental work has been undertaken.

The Thirty-Sixth Official Egg Laying Test concluded on 30th January, 1956. A full report on the Test was published in the March-April, 1956, issue of the *Rhodesia Agricultural Journal*. This was the first Test held under the new conditions of ten pullets per team housed as a flock and trap-nested. Results, as expected, were lower than in the past under single pen conditions; however, better results in future are anticipated following certain improvements to the pens and feeding. No awards from the South African Poultry Association were gained by competitors this year. The mortality was 13.5 per cent.

The Thirty-Seventh Annual Test commenced on 1st March and to date results have been considerably better than last year.

The Committee responsible for the handling of the Test has been augmented by the inclusion of a representative for the National Poultry Council of the Rhodesia National Farmers' Union. Mr. C. Trueman of Salisbury, a judge and experienced poultryman, was chosen for this position and his services in this connection are much appreciated.

A cash-score analysis based on the market value of eggs produced, less cost of feed consumed, is issued at the end of each period to competitors and is proving of great interest. It is proposed to publish the placings of teams on this basis as well next year. Following this it is hoped to commence a commercial section on these lines in future Tests to increase the value of the Egg Laying Test in this sphere. Our ability to carry out this improvement will depend on the building programme at Gwebi and the ability of the present staff to carry out the extra supervision.

Stock. Chickens hatched numbered 2,200, all pedigreed, which should provide nearly 1,000 pedigree pullets for testing next year. This is more than in previous years. Approximately 100 turkey poults were reared.

During the year 200 duck eggs were imported from Denmark and resulted in 72 ducklings of the Pekin and Khaki Campbell breeds being reared. Other purchases were breeding pens of Indian Game and Brown Leghorn for demonstration purposes, and four new turkey toms for breeding.

An additional brooder house is in course of construction.

Educational. A lecture programme of thirty lectures on poultry husbandry was given to 48 first year students and practical instruction at the Station continued throughout the year to all students.

A short course in Poultry was held from 24th to 28th September, attended by 36 farmers. The Poultry Officer (Matopos) and the Chief Poultry Officer, together with assistance from the Veterinary Department and the Horticulturist, gave the course, which was considered very successful.

The Federation of Young Farmers' Clubs held their annual camp at Gwebi also in September and received some practical instruction in poultry husbandry.

Revenue. Sales of eggs to hostel, staff, and Salisbury Hospital amounted to 12,093 dozen, realizing £1,813 19s. 0d. Table poultry sold amounted to 5,343 lb. for £534 6s. 0d. The sale of pedigree stud cockerels realized £136 from 53 birds sold. Egg Laying Test fees brought the total revenue to over £2,500.

Trials. The results of the trials of layers in folds designed to show the value or otherwise of this method of housing and at the same time the egg production potential of various first crosses was published in the *Rhodesia Agricultural Journal*, March-April, 1956, issue. In the same paper the results of three years' egg production trials, 1952-54, for caged layers were published and compared with the results from the folds and layers in litter houses under the title "Some Studies in Management of Layers in Southern Rhodesia".

Owing to the staff changes in the last two years, no trials are at present in progress except for the long-term progeny testing work.

Matopos Research Station

The Poultry Section at this Station has at last received some recognition with the appointment of a Technical Assistant and funds for building purposes.

During the year a new brooder house with a capacity of 1,800 chickens was completed, and also an incubator and egg room. A further two breeding pens were also erected. Whilst this is satisfactory, further extensions are essential before this Station will be in a position to do much useful work.

Stock. The number of stock on the station has increased to 1,200 and includes the two breeds, New Hampshire and Light Sussex, which have been introduced for work on table poultry production.

Trials (unpublished). (1) A feed trial was carried out to compare the value of feeding a more costly improved chick mash as against a cheaper one. Results were in favour of the improved chick mash for table bird production.

(2) The feeding of the antibiotic (Penicillin) in a chick mash was compared with a control chick mash and showed a definite response in growth rate in favour of the antibiotic feed.

There are four other trials in progress from which some preliminary results should be available next year.

A very successful poultry farmers' day was held at the section and another organized at a local farm.

Henderson Research Station

The fish feeding trials on egg production ended in February. The results were published in the *Rhodesia Agricultural Journal* in the July-August, 1956, issue. The results were highly satisfactory and indicate the value of surplus fish fry which may be available on farms for egg production and consequent saving to the farmer of high priced protein feeds.

Due to the officers in charge of the fisheries section being on sick leave and vacation it was not possible to commence the repetition of these trials on a commercial scale this year but it is hoped to do so in future.

Considerable duck hatching has continued at this Station by the Fisheries Section.

Extension and Advisory Services

The specialist extension and advisory services of this Branch are in great demand, which makes it the most important part of our work. The more important poultry areas have been visited at least twice. Many farmers' meetings have been attended, also Young Farmers' Clubs, and assistance given in farm planning operations to Conservation Officers.

The Poultry Officer (Matopos) was able to do more extension work this year in Matabeleland due to increased funds and the appointment of a Technical Assistant (Poultry) at the Station. These services are of great benefit to farmers and the industry.

Disease

There have been no further outbreaks of Newcastle Disease following the isolated case in July, 1955, and all restrictions were removed this year.

There have been the usual isolated cases of cholera, typhoid, and Bacillary White Diarrhoea, but there has been no increase. The B.W.D. testing service has continued in operation in Southern Rhodesia throughout the year and will keep the incidence of this disease and typhoid low.

Coccidiosis in chickens, as reported last year, is still one of the major causes of loss in growing stock. A really effective and cheaper curative treatment would be of great benefit.

In general terms the health of poultry stock in Southern Rhodesia is excellent.

Veterinary restrictions on the importation of poultry and hatching eggs into Southern Rhodesia from South Africa have been imposed throughout the year owing to the incidence of Epidemic Tremor disease. The world-wide distribution of many of the more serious poultry diseases necessitates importations of stock into Southern Rhodesia being very strictly controlled by the Veterinary Department, with the full support of this Branch. The main sources of breeding stock into Southern Rhodesia are the United Kingdom and Denmark, where the disease position is particularly well under control. This policy is causing some hardship to breeders of certain breeds not obtainable in these two countries, notably Australorps, and it is possible that shortly some scheme of State importation under quarantine for specific breeds may have to be considered to obtain new blood lines.

The Northern Rhodesia Veterinary Department allow importations under permit freely, and therefore Southern Rhodesia has to impose restrictions on the movement of poultry from north to south. This is no hardship however as there is virtually no demand for movement in this direction.

The Veterinary Laboratory, Southern Rhodesia, continues to issue chicken pox vaccine and to perform diagnostic and postmortem examinations on poultry.

Shows and Clubs

All Agricultural Shows exhibiting poultry were attended and both the Poultry Officer (Matopos) and myself acted as judges for the Societies and Clubs. Entries and quality of stock were good at most Shows and exceptional at the Royal Salisbury and Umtali, at which both Societies had to provide new and enlarged premises. Poultry Branch exhibits were featured in the Departmental Halls at both Salisbury and Bulawayo Agricultural Shows. The Bulawayo & District Poultry Club held a successful Young Bird Show in April in addition to the annual Show.

Club activity generally has decreased owing to the decision of the National Poultry Council that a control scheme for eggs could not be proceeded with as farmers were not in agreement on the issue. Their activities have been confined largely to Show holding, though the Bulawayo Club have undertaken excursions, poultry days, etc., at which the Poultry Officer (Matopos) has taken a prominent part.

Acknowledgement

I wish to acknowledge the efficient services at all times rendered by all members of this Branch.

DAIRYING

R. G. JONES
Chief Dairy Officer

Improved methods of milk production and management of dairy herds are making the industry less dependent on the agricultural "season" but good and bad seasons will still have a serious effect on production. The season under review was a good one although the rather late onset of the rains in Matabeleland delayed the main flush of milk in that area. It is apparent from the high level of production maintained during the winter that the season was favourable for the production of winter feed.

Production of Dairy Produce. This has been another record year for dairy production. The quantity of milk purchased by the Dairy Marketing Board again showed an increase of just over one million gallons and the overall increase in milk production, based on preliminary figures, show an increase of about 1¼ million gallons. It should be noted that the preliminary figures given in my report for 1954-55 for total milk production and consumption as whole milk and cream, have had to be amended considerably. These corrected figures are given in Table I, which gives the dairy production figures from 1920 to 1956.

The trend of the development of the industry continues in the direction of the sale of whole milk from the farms. As the increase in consumption of whole milk has not kept pace with the increase in production, and as this increase in whole milk production has almost entirely been sold to the Dairy Marketing Board there has been a large increase in the manufacture of cheese by the Dairy Marketing Board, from milk surplus to whole milk requirements. There has also been an increase in milk supplies to the Gazaland Co-op. Cheese Factory, Chipinga, which is the only cheese factory operating outside the Dairy Marketing Board.

The figures given in Table I do not include the production of farm butter and farm cheese other than Cheddar cheese, but the quantity of butter and cheese produced on farms for sale, are very small and would have a negligible effect on these figures.

TABLE I

DAIRY PRODUCTION: 1920 to 1956:

Year	Butter 1,000 lbs.	Cheese 1,000 lb.	Liquid Milk (i) 1,000 gallons	Total Gallons
1920	600	79	258	2,000,000
1930	1,768	163	1,008	6,100,000
1940	1,686	383	2,095	6,910,000
1945	1,224	702	3,848	7,750,000
1950	900	394	5,720	9,000,000
1951	900	467	6,045	9,505,000
1951/52	975	490	6,730	10,390,000
1952/53	964	578	7,350	11,070,000
1953/54	906	1,007	7,590	11,670,000
1954/55	1,096	1,267	7,632	12,514,000
1955/56 (*a*)	1,083	2,170	7,930	13,760,000

(i) Milk available for use as fresh milk, fresh cream and ice cream.
(*a*) Preliminary figures.

Figures for the period 1920 to 1951 refer to calendar years, while figures from 1951 onwards refer to the dairying season, 1st October to 30th September.

All milk supplied to the main consuming areas, other than that retailed by producer-retailers, is purchased by the Dairy Marketing Board, and the rapid increase in the amount of milk disposed of in this way is illustrated in Table II.

TABLE II

Year	No. of suppliers (August)	Total milk supplied (Gallons)
1950/51 (*a*)	204	4,512,000
1951/52 (*a*)	245	5,235,000
1952/53	280	5,638,000
1953/54	322	6,488,000
1954/55	364	7,817,000
1955/56	403	8,852,000 (*b*)

(*i*) Purchases by the Milk Marketing Committee.
(*a*) Preliminary figures.

It is interesting to observe that in addition to the increasing numbers of producers supplying milk to the Dairy Marketing Board, there is an increase in the average supply per farm in recent years.

Creameries, Butter Production and Consumption. There have been no changes in creamery registrations during this season and of the four registered creameries one did not produce any butter. All butter manufacture and handling of imported butter was done, therefore, by three creameries situated at Salisbury, Gwelo and Umtali.

Butter production was slightly less than during the previous season, but this was due to less surplus milk being separated for butter production by the Dairy Marketing Board. In fact, butterfat supplies from cream producers were higher than for the previous season. Although the Dairy Marketing Board was better equipped to manufacture surplus milk into cheese during this season than previously, it was unable to cope with the full surplus during December and January. The surplus milk which could not be manufactured into cheese during these two months was separated for butter production, and this was equivalent to about 20,000 lb. of butter.

Farm butter production for sale remains at a low figure and any alteration in this item would not affect the overall production figures.

Consumption of butter continues to increase as illustrated in Table III. The shortfall was made up with imported butter and there was no difficulty in meeting the demand.

TABLE III

Year	Production (1,000 lb.)	Consumption (1,000 lb.)	Shortfall (1,000 lb.)
1945/46	1,081	1,613	532
1950/51	767	2,643	1,876
1951/52	975	3,062	2,087
1952/53	964	3,207	2,243
1953/54	906	3,232	2,326
1954/55	1,096	3,482	2,386
1955/56	1,083	3,650	2,567

It will be observed that an increasing quantity of imported butter has been required to meet the demand and during the season 2,561,000 lb. of butter were imported. Exports, mainly to Portu-

guese East Africa, increased to 98,000 lb. compared with 83,000 lb. for the previous season. The stock of butter in hand at the end of the season was 394,167 lb. compared with 590,456 lb. at the beginning of the season.

Butter was imported from the same three countries as last year in the following proportions:—

New Zealand	36 per cent.
Kenya	35 per cent.
South Africa	29 per cent.

There was no change in butterfat prices during the season and Table IV gives the seasonal minimum prices paid.

TABLE IV

	1st Grade Cream	*2nd Grade Cream*
January to March	3s. 0d. per lb.	2s. 9d. per lb.
April	3s. 10d. per lb.	3s. 7d. per lb.
May to November	4s. 8d. per lb.	4s. 5d. per lb.
December	3s. 10d. per lb.	3s. 7d. per lb.

The wholesale and retail prices of first and second grade creamery butter were reduced by a further 1d. per lb. on 1st January, 1956, and from that date onwards were as follows:—

	1st Grade	*2nd Grade*
Wholesale	3s. 8d. per lb.	3s. 6d. per lb.
Retail	4s. 0d. per lb.	3s. 10d. per lb.

This drop in the price of butter was due to a reduction in price of imported butter. There was no price control for third grade cream and third grade butter.

All imported butter and nearly all locally manufactured butter was check graded before sale and degradings were negligible. The quality of the butter within the grades was substantially the same as in previous seasons. All imported butter was first grade and of good quality, except for one consignment which was returned to the suppliers.

Table V shows the percentages of the various grades of butter manufactured during the last five years. It will be observed that the average quality of the butter has improved during the last two years, and this can be attributed mainly to the separation of fresh milk by the Dairy Marketing Board, although there does seem to be an overall improvement in the quality of the cream supplies from farmers. The quality of the cream could be improved still further if sufficient staff were available to advise farmers on cream production.

TABLE V

Year	1st Grade	2nd Grade	3rd and Below Grade
1951/52	79·6	14·9	5·5
1952/53	80·0	13·8	6·2
1953/54	78·5	13·5	8·0
1954/55	87·0	9·0	4·0
1955/56	86·6	9·8	3·6

Cheese Factories, Cheese Production and Consumption. Six cheese factories operated during the season and no new factories were registered. One farm cheesemaker manufactured Cheddar cheese but his production amounted to less than 0.5% of the total produced. It is estimated that other farm cheesemakers, making unspecified types of cheese produced less than 0.1% of the total cheese manufactured.

Total cheese production reached the record figure of about 2,170,000 lb. of which the Gazaland Co-op. Cheese Factory, Chipinga, produced about 180,000 lb. This large increase in total cheese production was due to the increase in milk, surplus to whole milk requirements, delivered to the Dairy Marketing Board.

Cheese consumption also increased very substantially, and about 170,000 lb. of cheese was supplied to Northern Rhodesia. It is expected that considerably more cheese will be required to meet the demand in Northern Rhodesia during the coming season, as facilities for milk distribution on the Copperbelt are being provided, and are expected to come into use about April, 1957. Thereafter the locally produced milk which is now being manufactured into cheese will all be required for the whole milk trade.

Accurate figures for consumption in Southern Rhodesia are not available, but it is estimated that consumption of Cheddar and Gouda cheese in this territory was over 1½ million lb. Consumption of imported processed and special types of cheese is estimated to have been between 150,000 and 200,000 lb.

Although the increase in population would account for some of this increase in consumption, it is evident that consumption per head of the population has also increased. About 20,000 lb. of Cheddar cheese was imported from South Africa in order to ensure an adequate supply of mature cheese during the Christmas season of 1955, although local stocks of immature cheese were high at that stage. There is no doubt that a regular and adequate supply of cheese has had the effect of increasing consumption.

A high level of cheese production was maintained through the winter and, in spite of increased consumption and supply of cheese to Northern Rhodesia, the Dairy Marketing Board has been unable to reduce stocks to a safe level for the beginning of the next season. It is clear that milk supplies have now reached such a level that milk, surplus to whole milk requirements, will produce more cheese than is required for local consumption.

A further improvement in the quality of the cheese produced resulted in the highest percentage of first grade Cheddar cheese for many years. The grading figures for the last seven years are given in Table VI. Although the figures for the year under review show a high percentage of first grade cheese there is still room for improvement, especially in the dressing of the cheese and the elimination of surface mould growth in the curing rooms. It is also clear that a longer maturing cheese should be made now that ample supplies of milk are available to maintain stocks.

TABLE VI

CHEDDAR CHEESE GRADINGS AS PERCENTAGE OF TOTAL CHEESE GRADED

Year	1st Grade	2nd Grade	3rd and Below Grade
1949/50	90·3	7·3	2·4
1950/51	80·3	19·3	0·4
1951/52	74·8	23·5	1·7
1952/53	47·2	47·4	5·4
1953/54	47·9	13·6	38·5
1954/55	83·8	13·8	2·4
1955/56	94·9	4·2	0·9

A subsidy of 6d. per lb. of cheese produced was paid to the Gazaland Co-op. Cheese Factory and to the one farmhouse cheesemaker who makes Cheddar cheese.

Price control on cheese remained the same as for the previous year and this only operated on 1st and 2nd Grade Cheddar cheese and Gouda cheese. Controlled prices were as follows:—

	1st Grade	*2nd Grade*
Wholesale	2s. 6d. per lb.	2s. 4d. per lb.
Retail	2s. 10d. per lb.	2s. 8d. per lb.

The quality of the Roquefort cheese produced at Gatooma was disappointing and production was suspended early in this season. Since then small quantities only have been manufactured and these mainly on an experimental basis. Some stocks of poor quality Roquefort cheese had to be destroyed. The quality of the Roquefort cheese produced late in this season seemed much better and it is hoped that a satisfactory product will be produced consistently in the near future. A certain amount of experimental work has been done on this cheese but this work has been hampered by shortage of staff in the Dairy Branch.

Milk Supplies. The figures given in Table VII, which relate to milk handled by the Dairy Marketing Board, illustrate the development of the industry. The Dairy Marketing Board operates in the main consuming areas, but has the general effect of balancing the local supplies of milk in most other areas, as, when the local demands for whole milk have been met, most of the surplus finds its way to the Dairy Marketing Board. The Table, therefore, includes most of the milk surplus to whole milk requirements, but consumption in the main centres in the Colony only.

TABLE VII

Year	Milk purchased (1,000 gallons)	Surplus milk (1,000 gallons)	Apparent consumption as whole milk and cream (1,000 gallons)
1951/52	5,235	249	4,986
1952/53	5,638	441	5,197
1953/54	6,488	1,026	5,462
1954/55	7,817	1,876	5,941
1955/56 (*a*)	8,852	2,464	6,388

(*a*) Preliminary figures.

The figures given in Table VII do not include milk sold by producer retailers in these areas.

It is evident that production of milk is such that the supplies required for the expanding whole milk trade are assured and that there is likely to be an increasing quantity of milk available for

manufacturing purposes, providing the industry does not suffer a very serious setback due to climatic conditions and serious price reductions.

Milk Prices. A new price structure for milk supplied by producers to the Dairy Marketing Board, and an increase in the consumer price of milk became effective on 1st January, 1956. Prior to this date producers were guaranteed a monthly price for milk supplied, irrespective of the use made of this milk. The effect of the new producer price structure is that the price varies according to utilization. This new price structure and the increase in consumer price, had the effect of reducing the overall subsidy paid on milk.

Under the present producer price structure the producer is guaranteed a certain standard price for milk used for whole milk consumption plus a safety margin equal to 20% of that quantity and is paid a manufacturing value of 1/9d. per gallon for all milk surplus to this quantity. This system is operated by the Dairy Marketing Board ascertaining the total quantity of milk used for whole milk consumption and the total intake in each month, and then establishing an average price to be paid for all milk. This price is then adjusted by the quality premiums or deductions applicable to each individual producer.

The standard prices paid for milk of standard quality and for a quantity equal to one-and-a-fifth of the quantity of milk used by the Board for whole milk consumption from 1st January, 1956, and the actual prices paid to producers, subject to the quality scheme adjustments, are given in Table VIII, along with the comparative price for the same period of last year.

TABLE VIII

Month	Standard price per gallon 1956	Actual price paid per gallon 1956	Price paid per gallon in 1955
January	2s. 10d.	2s. 6·2d.	2s. 6d.
February	2s. 10d.	2s. 8·0d.	2s. 6d.
March	3s. 8d.	3s. 4·7d.	3s. 4d.
April	3s. 8d.	3s. 5·3d.	3s. 4d.
May	3s. 8d.	3s. 4·8d.	3s. 4d.
June	3s. 8d.	3s. 6·6d.	3s. 4d.
July	4s. 0d.	3s. 10·1d.	3s. 9d.
August	4s. 0d.	3s. 9·3d.	3s. 9d.
September	4s. 0d.	3s. 7·9d.	3s. 9d.

Retail prices for milk for January, 1956, onwards were:—

	Cash	*Credit*
Undelivered milk per pint	6½d.	6¾d.
Delivered milk per pint	7d.	7¼d.

The system for the payment for milk supplied to the Dairy Marketing Board on a quality basis was continued as before and all tests for this purpose were carried out by the Dairy Officers of this Branch. This work entailed the sampling and testing of over 9,500 consignments of milk and the necessary calculation of premiums and deductions to establish the monthly prices to be paid to each producer. In addition to this work a large number of advisory tests were carried out in order to assist producers in maintaining a supply of good quality milk. Although some consignments of milk were of an unsatisfactory standard, these were comparatively few and the results of these tests show that the average quality of milk supplied is good. There is no doubt that the scheme has been of great benefit to the industry as a whole and has ensured a supply of good quality milk by the maintenance of a high standard of clean milk production.

Fresh Cream and Other Dairy Products. As far as can be ascertained the fresh cream demand has been met and indications are that this trade is increasing. Fresh cream is supplied direct by some producers and by the Dairy Marketing Board mainly to shops who sell to the public.

Some investigations have been made into the possibility of producing dried milk and condensed milk, but there is no immediate prospect of producing these commodities in the territory although it is very likely that some dried skim milk powder will be produced by the Dairy Marketing Board during the next flush season.

Towards the end of the period under review a small quantity of sterilized milk was produced at Bulawayo and an effort is to be made to put this product on the market early in the new season.

Dairy Bonus Scheme. Just under £6,000 was paid out to producers under this scheme for the season ended 30th September, 1955, and it is anticipated that payments for the season under review will amount to £10,000. This large increase in bonuses to be paid is due mainly to a modification of the conditions of the scheme for suppliers of milk to the Gazaland Co-op. Cheese Factory, Chipinga, which will result in a large number of producers in that area getting the bonus.

Milk Recording. One additional post of Milk Recorder was authorized in July, 1956, but it was not possible to expand the scope of the scheme at that time because of the necessity to grant leave to other Milk Recorders, and the additional Milk Recorder was used for relief purposes. This

scheme continues to expand and there is an urgent necessity for further additional staff to cope with the increasing amount of head office work that the scheme entails.

Further progress has been made in disposing of the backlog of annual statistical returns but it has not been possible to bring these up-to-date. The results of the Annual Milking Competitions up to September, 1954, are available and will be published in the *Rhodesia Agricultural Journal*. Herd averages up to the same date have been prepared and are to be published in the *Journal* as soon as possible.

Table IX gives the results of the Annual Milking Competitions for the last few years and the combined official and semi-official Herd Averages are given in Table X.

TABLE IX

PRODUCTION OF WINNING HERDS IN MILKING COMPETITION

Year	Milk Section	Butterfat Section
1948/49	12,933 lb.	443·3 lb.
1949/50	13,509 lb.	460·7 lb.
1950/51	14,400 lb.	459·6 lb.
1951/52	15,207 lb.	493·2 lb.
1952/53	13,548 lb.	486·0 lb.
1953/54	12,917 lb.	440·8 lb.

TABLE X

HERD AVERAGES — PEDIGREE AND GRADE HERDS

Year	Completed lactations	Average milk production per cow	Average butterfat production per cow	% Butterfat	Days
1947/48	4,699	5,897	216·6	3·73	278
1948/49	5,173	5,891	217·6	3·70	277
1949/50	5,184	5,776	212·1	3·67	276
1950/51	5,381	5,840	215·0	3·68	271
1951/52	5,436	6,412	244·1	3·81	279
1952/53	5,554	6,265	228·3	3·64	274
1953/54	5,798	6,583	236·1	3·59	279

No success has yet been achieved in filling the vacant post for a Dairy Officer to take charge of the Milk Recording Scheme and to establish a Bureau of Milk Records. Owing to the difficulty in getting a suitable applicant to fill this post and the increasing necessity for this work to be done, it will probably be necessary to modify the original idea and split the work between an officer to establish a Bureau of Records and a Dairy Officer to take charge of the Scheme.

General

The rapid development of the industry continues and, as stated previously in this report, the main development is toward the disposal of whole milk off farms. Butterfat supplies to creameries from farms show an increase but the higher butter production during the last two years has been mainly due to separation of surplus milk and whey by the Dairy Marketing Board. Cheese production has overtaken consumption and other outlets for surplus milk have to be explored.

During the early part of the season negotiations took place between the agents of the Rhodesian Co-operative Dairies in Bulawayo and Government regarding the purchase of these dairies by the Dairy Marketing Board. These negotiations culminated in the purchase of the Model Dairy and certain plant and equipment from the Bulawayo Creamery by the Dairy Marketing Board in March, 1956. This means that the Dairy Marketing Board is the sole processor of milk in all the main centres of the territory and is also responsible for nearly all milk distribution in these areas. The Board has acquired a suitable site for the erection of a new dairy in Salisbury, and it is hoped that it will be built and in operation within three years. The main tasks confronting the Board at the moment are the erection of the new dairy in Salisbury, endeavouring to increase the sale of milk, and exploring alternate means for the disposal of surplus milk, probably as skim milk powder and butter.

Activities of the Dairy Branch. This has been another very difficult year for the Branch as no success has been achieved in finding suitably qualified men to fill vacant posts. For the past three years the Branch has been two short in the professional establishment of seven, and this combined with the steadily increasing duties devolving upon Dairy Officers with the expansion of the industry, makes it increasingly difficult to carry out even the main functions. It is clear from the results of advertisements of these posts that suitably qualified men are in great demand throughout the world and that we are likely to find it increasingly difficult to recruit officers under present conditions.

As European Agriculture in Northern Rhodesia came under the control of the Federal Ministry of Agriculture on 1st January, 1956, the Chief Dairy Officer has had to undertake added responsibilities in that territory. This has added to the difficulties of administration of the work of the Branch and the staff position is critical.

With the willing co-operation of all officers and staff in carrying out extra work and working very long hours, it has been possible to maintain essential services. The services provided include inspection of factories and farms, grading of dairy produce, sampling and testing of milk, advisory work on the production of milk and manufacture of milk products, lecturing at Gwebi Agricultural College, and various other activities such as judging of dairy produce at Agricultural Shows and attending meetings of the Dairy Marketing Board and farmers' organizations.

Particular mention must be made of the willing, loyal and efficient co-operation of all officers and staff of the Branch during another difficult year.

GWEBI AGRICULTURAL COLLEGE

DR. W. L. FIELDING
Principal

Education

Six courses of students have now passed out from the College. It is of interest that since 1950, when the College opened, 78% of those who sat the first year examinations have qualified for the Second Year; and of those Second Year Students who have sat the Final Examinations, 83% have been awarded the Diploma of the College. The general standard of work for the Diplomas was good, in the year under review.

The demand for Gwebi-trained men continues to increase; in fact the possibility of supplying the needs of the Federation in this connection seems more remote than last year. On the other hand the accommodation at Gwebi may now be judged adequate for the number of applications received from suitably qualified young men.

There seems to be a growing demand from young women for this type of training. A contributing factor is no doubt the interest in farming engendered by the Young Farmers' Club Movement.

During the Royal Show, Gwebi College accommodated the Y.F.C. National Camp of over 150 delegates from all parts of the Federation, Kenya and the United Kingdom. This body of young people was accommodated at the College Hostel and a number of adult club leaders and helpers also resided at the Hostel. During the first four days of the camp groups of Young Farmers were instructed in various spheres, such as animal husbandry, field husbandry and engineering. The instruction took the form of demonstrations by the College Staff and a few itinerant demonstrators. Selected Young Farmers were able to "brush-up" in tractor driving, vegetable planting, poultry dressing, flower arrangement and so on. The Great Hall was used extensively for meetings, socials, dances, film shows and a church service. A highlight was the Y.F.C. National Annual General Meeting, at which Lord and Lady Malvern were the guests of honour. During the last four days of the camp the delegates were transported to the Royal Show grounds in Salisbury, in buses, and returned to Gwebi in the evening. The College sports facilities, particularly the swimming bath, were used by the delegates.

Other College long vacation activities have included the running of two short courses for farmers, each of five days duration.

The first course, of a general nature, ran from the 17th to 21st September and was attended by 32 farmers. The applications exceeded the number it was possible to take, bearing in mind that too large a class is unsatisfactory for demonstrations. The names of unsuccessful applicants have been recorded and these will be given priority for future courses, should they wish to attend. The mornings were devoted to lectures and the afternoons to demonstrations on the farm and in the workshops. Subjects covered in lectures were: the background of Rhodesian farming; the work of the College; feeding and breeding farm animals; farm accounting; veld and improved pastures; the use of N.P.K. and organic matter in farming, and the construction and maintenance of various types of engine.

The Poultry Course ran from the 24th to the 28th September. There were again more applicants than could be taken; 32 students attended. Lectures were given in the mornings and demonstrations in the College Poultry Section, after lunch. All aspects of poultry husbandry were covered and a few lectures were devoted to the work of the College, farm records and accounts, horticulture and veterinary aspects of poultry production.

From the interest taken in these courses by men and women it is apparent that the facilities of Gwebi could usefully be developed for adult education in various agricultural subjects. It may be advisable to provide further residential accommodation; so that these courses need not be confined to the College long vacation. The provision of such additional accommodation might

well be considered together with the possibility of providing accommodation for women students in courses of longer duration. Additional staff would also be needed; visiting lecturers can play a useful part but are not always available when required; additional residential staff would be needed.

The number of passes of Gwebi students into the Second Year has been such that the first and second year diploma courses will be approximately equal in numbers, in the 1956-57 College Year; this is a very satisfactory state of affairs, from many points of view.

Sport has continued to play a full part in the College life. Cricket, rugby, hockey, athletics, tennis and water-polo were all well supported, whilst many successful dances and a leavers' dinner were held at the College.

Treasury authority has been given for the continuation of the policy of investing general funds in steers which are run in feeding trials, to study the behaviour of various breeds of cattle. Revenue accruing from the sale of these animals is set aside for the construction of specific amenities. The swimming bath was partly built in this way; a pavilion and squash court are now planned.

Great interest continues to be evinced by Gwebi men in proceeding overseas for further training and practical experience in farming. The R.T.A. Rhodes Centenary Bursary has now been awarded three times, the grants assist students to proceed overseas. During the year the Nuffield travel scholarships were both awarded to old Gwebi students.

The Old Gwebi Students Association (Gwebians) is now taking definite and active form.

The nature and organization of practical instruction continues to improve with experience and the provision of expanded facilities, particularly equipment.

In Engineering the programme of lectures was slightly modified. The inadequate standard of mathematics of many students continues to be an embarrassment to teaching of the subject, and much more emphasis is now being placed on knowledge of elementary mathematics, from the start of the course. Elementary electricity as applied to motor vehicle circuits has been moved from the second to the first year syllabus in order that students may better understand the operation of I.C. engines, the study of which forms a major part of the first year course. The course in hydraulics has been simplified by the omission of complicated formulae for friction in pipes and the introduction of rules and tables which provide a simple and practical solution with sufficient accuracy for most farm purposes. There has also been a very successful new approach in the Building part of the Engineering course. In the first year building was covered entirely as a practical subject with a number of demonstrations when notes were given. In the second year lectures were given on concrete, and the planning and design of buildings.

It has been necessary to spend more time on the teaching of elementary chemistry, particularly organic, in order to provide an adequate background for the teaching of animal and plant nutrition.

Development

Work has continued on the brick under asbestos village for African employees, with the construction of a group of semi-detached houses. The school, under the aegis of the Apostolic Mission opened in January and is running successfully. Small allotments of land have been made for each family, in Fielding field, adjoining the village. This land is ploughed and green cropped by the College and the African families are thereafter responsible for the planting and care of the crops. Proper conservation and rotations are insisted on. A football ground for the African employees has been prepared. It is satisfactory to record that the residents take a keen interest in the gardens round their houses and at the School, and that there is a noticeable improvement in the contentment of the labour force resulting from these measures. The village is inspected once a week and the residents have been persuaded to make proper use of the waterborne sanitation provided.

In the College milking shed the ten year old mechanical milking equipment was in large part replaced, resulting in cleaner milk production.

In the piggeries the farrowing sties were modified and farrowing rails introduced to four of them, while two deep litter semi-open courts were built and have greatly increased the general health of the breeding stock.

A complete new handling yard for cattle dipping, weighing and veterinary treatment was constructed and has proved very satisfactory and of great interest to visitors. This unit is the second stage of an overall plan for the cattle area. The first stage was the new dairy pens (1954-55), and the final stage will be the building of new fattening pens in 1957-58. The handling yard has been carefully designed to reduce labour and maintenance to a minimum. The construction is of metal, mounted in concrete and the welding work was mainly carried out by students.

A new workshop for carpentry and building instruction has been completed. This has been necessary because of the increase in student numbers. The old building workshop will be converted to provide extra facilities for mechanical work, particularly welding and the building up of experimental machines.

A self contained motor vehicle workshop with pit and provision for a hoist and benches was constructed in the hostel area. It was built entirely by students as part of their practical work, and is intended entirely for the use of students so that they may gain practical experience in their spare time by overhauling their own vehicles. The running of this workshop will be organized by the Student Association, in the same way that sports and social activities are organized and tools will be provided from the Fund Account in the same way that sports gear is provided.

A metal cycle shed was constructed by the students, at the hostel, as part of their practical work.

Another engineering development has been the provision of a range of engines, mounted on stands, for engine overhaul and fault-finding instruction. This development ensures that every Second Year Student takes part throughout the overhaul of an engine.

An archway designed by P.W.D. architects was constructed, largely by students, and erected at the College main entrance.

The going fleet of tractors was increased with the addition of a row-crop tractor and a smaller wheeled tractor. The fleet now includes three row-crop tractors, three smaller wheeled tractors (and four tip-trailers) and an old track-type tractor. This increase has made more timely operations possible and provides better facilities for student instruction. The College is now satisfactorily equipped with ploughs, planting and cultivating machinery.

In the poultry section a new brooder house is being constructed to a new design, whilst a new spray irrigation system was installed for the production of green feed.

A dividing fence was erected in Acton meadow making it possible to use this valuable vlei area more intensively. Piping was successfully laid to the North-Eastern camps, using the method of drawing lengths of piping behind a tractor-drawn sub-soiler. Fire breaks and fire drill have been much improved.

Production

Rainfall was normal, 31.39 inches compared with a 40 year mean of 31.96 inches. The season was very favourable until February, rain being frequent enough to keep crops growing and yet not embarrassing cultural operations. An unusual feature was the heavy rain, 1½ inches, in May.

Field production included:—

Crops	Acres	Production	Yield/acre
Maize (Broadbalk Field)	70	1,531 bags	21·8 bags
Maize (Gwebi South)	150	1,806 bags	12·0 bags
Sunflowers (seed)	11	66 bags	6·0 bags
Groundnuts	16	171 bags	10·71 bags
Natal Sugar Beans	11	24 bags	2·17 bags
Soya Bean (seed)	4	16 bags	4·0 bags
Winter Feeds			
Maize Silage	33	360 tons	10·9 tons
Napier Silage	14	56 tons	4·0 tons
Legume Hay (soya bean)	42	71 tons	1·69 tons
Legume Hay (cowpea)	56	39 tons	0·69 tons
Sunflower Head Meal	11	13 tons	6·35 tons
Veld Hay (fertilised)	29	53 tons	1·8 tons
Veld Hay (non-fertilised)	60	30 tons	1·0 tons
Veld Hay (ground nuts)	16	9 tons	0·54 tons

The following notes analyse the total maize yields quoted above.

38 acres of the maize on Broadbalk were hand planted with $A_1 \times N_3$ single hybrid seed and gave an average yield of 25 bags acre. The highest yielding strip, of 12 acres, gave 26.3 bags/acre, a record for the College Farm. 16 acres machine planted on Broadbalk with double hybrid No. 1 gave 20.29 bags acre. 16 acres of Southern Cross Open Pollinated maize gave 16 bags/acre. A heavy wind in January lodged the Southern Cross, whilst the single and double hybrids did not lodge. *Diplodia* and *Fusarium* infection was very heavy in the Southern Cross and 20 bags were discarded as dangerous for human and stock consumption. The superiority of hybrid maize was therefore once again clearly indicated, this time in a long growing season.

A breeding maize programme was successfully carried out and the Chief Agriculturist commented favourably on the work.

The yield of groundnuts, though higher than last year was disappointing; the crop looked extremely well at one time but heavy rains damaged the crop in the later stages. Groundnuts are not, of course, at their best in heavy soil and this crop will be removed from the Broadbalk rotation and grown on a demonstration plot scale elsewhere. The Natal Sugar Beans also suffered from the heavy late rains.

Of the crops grown for legume hay soya beans were outstandingly the best, the cowpeas going off badly with moziac and wilt and suffering, in windrows, from the late heavy rains, which the soya beans withstood quite well, having been harvested with a reaper and binder and stooked. It has been difficult to secure adequate supplies of cowpea seed and it is proposed to use other legumes for legume hay, green manure and legume graze purposes next year.

When the College opened many of the arable lands of the Gwebi farm appeared to be in a generally low state of condition and fertility. The College Farm is now showing the benefit of the systems of management introduced by the College staff, in obviously improved soil structure and heart, and in very much higher yields.

The Star Grass pasture on hayfield was ploughed out and a green crop planted; *Paspalum dilatatum* and Katambora Rhodes Grass will be planted. The Giant Star on Kennedy field produced very poorly and the accumulation of dead material has been burned, preparatory to discing and fertilizing with the first rains. *Panicum coloratum* (Makarikari) on Johnson field has done well but is a sparse stand and in February the attempt was made to seed Panicum Bambatsi between the rows to improve the cover, but germination was poor. These pastures are used in the grazing scheme for the dairy herd and for folding poultry.

In the Animal Husbandry Section the outstanding feature was the very satisfactory overall increase in production exhibited by the College Friesland Dairy Herd.

Average production 1954-55 was 920 gallons yielding 329 lb. butter fat per lactation with a herd average of just over three gallons daily.

The figures for this year were as follows:—

	Lactations	*lbs. Milk*	*lbs. B.F.*	*% B.F.*
(*a*) *Pedigree Frieslands*	11	10,206·8	382·89	3·75
(*b*) *Grade Frieslands*.	20	10,235·5	361·05	3·53

These figures indicate an increase of 102 gallons per lactation and a daily average of nearly 3½ gallons together with an increase of 40 lb. B.F. per lactation.

The College cattle did well at the Royal Show, outstanding being the Hereford cow, Oxo's Marina of Mayfield, adjudged Champion Hereford and Reserve Champion beef cow.

Revenue from the College farm is increasing. Much of it comes from livestock, as the main production of the fields is fed to dairy and beef cattle, pigs, sheep and poultry. Some of the potential revenue is invisible as considerable assistance has been given to other Government stations in building up their herds of dairy cattle and pigs and flocks of poultry.

Landrace pigs have been introduced to the College and have evoked considerable interest among students and prospective buyers.

Poultry produced 12,093 dozen eggs, 53 x 3 lb. of table poultry and fifty-three pedigree cockerels were disposed of at the annual auction sale. New turkey blood was introduced and a waterfowl section started. 2,200 chickens were incubated. Russian Comfrey, Ronpha Grass, oats, chou mollier and lucerne are used as green food.

The possibilty of demonstrating various types and sizes of farming unit, within the overall framework of the College Farm, is being considered.

Immediately apparent are:—

(i) *Broadbalk Field*, together with adjacent areas of veld and improved pastures, and a small irrigation project, an area of 500-600 acres in all, of clay soils.

The animal factor, in the form of a dairy herd, pigs and poultry can be economically integrated.

(ii) *Gwebi South*, an area of 400 acres under maize, green crop, and legume hay, with adjoining vlei, 270 acres in extent, together producing maize and beef.

These units are not yet autonomous, but as development proceeds they could become so. Meanwhile they serve, even in their present state, as useful media for demonstration to students.

Research

Research at the College remains limited. In prescribed spheres useful work continues, in both crops and pastures. Useful developmental work has been done in engineering and practical investigations proceed in animal husbandry, but real progress in these two sections is dependent on the provision of additional staff. Much of the time of Gwebi staff is devoted to practical operation in various spheres of the College Farm and individual instruction of students. On the whole they do not, with present staffing, have sufficient time for research. It is always important that teachers in agriculture, at whatever level, should have research opportunities, and it is therefore hoped that there will be a general improvement in this connection, as Gwebi develops.

Crop Husbandry. Last year a rotation trial was reported, its object being to study the effects of a short ley continuously grazed (summer and winter) on heavy soils. This trial was of a pilot nature, to study, in particular, technical difficulties. The main difficulty which arose was keeping the animals on the grass plots by means of an electric fence; the animals continually broke out, despite various attempts to improve the effectiveness of the fence. For strip grazing on a pasture, a few hours at a time an electric fence may be successfully employed but for continuous confinement apparently not. Therefore, for the above reason and also that the design of the experiment does not lend itself to the production of critical results, it will be discontinued. An attempt will be made to design a similar experiment, capable of effective cattle management and of producing critical results.

The only other point of interest arising from the rotation trial was that maize after grass and the first year after green manure gave 5 bags per acre more than the second maize crop after green manure.

A maize trial was again carried out, giving the following results:—

D.H. 1	27·74 bags/acre
S.H. 50 h. 35	26·02 bags/acre
D.H. 6	25·35 bags/acre
D.H. 8	24·66 bags/acre
Hickory King	19·49 bags/acre
Southern Cross	17·33 bags/acre

L.S.D. 4·13 (5%) and 5·71 (1%) bags/acre.

A similar trial last year revealed no significant difference. This year, the hybrid material is very definitely superior to the open pollinated, and the comparison is similar to that quoted above on a large field scale.

Plant population studies were continued, but were inconclusive. One trial indicated a decreasing yield (9.03 to 5.62 bags acre) with increasing populations (10,000 to 22,000 plants acre), whilst the other gave a significant increase for 18,000 plants acre (27.14 bags acre) compared with 10,000 plants acre (24.66 bags acre) but 14,000 plants acre (26.62 bags acre) was not significant over 10,000 plants/acre. There were no significant interactions with fertilizer treatments.

In the coming season the College will plant a complex population-fertilizer trial, in line with other Federal stations, which it is hoped will give conclusive results.

The study of sulphate of ammonia top-dressings after green manure was continued. Up to 150 lb. per acre there was a tendency for increased yield, but it was not significant. Yield levels ranged from 25.52 to 28.06 bags acre in this experiment. 300 lb. acre increased yield significantly, with the yield level at 31.25 bags acre, but the application of 450 lb. acre gave no further significant increase in yield.

In a separate trial, where maize followed maize an application of 150 lb. acre of sulphate of ammonia did give a significant increase over nil, but 300 lb. acre gave no further significant increase. Yields in this trial were at the 24 to 28 bags acre level.

In the light of these experiments it is not proposed to change the general practice on the College Farm at present. This is about 14,000 plants acre and 250 lb. acre sulphate of ammonia top-dressing.

In a trial designed to study fertilizer requirements after a long grass ley, second year maize indicated various reactions between basal dressings of nitrogen and top-dressings. The general indication is that where the level of basal dressing is low, and particularly where none has been applied, the application of top dressing has been highly beneficial. As the level of basal dressing increases the effect of top-dressing decreases until at the highest rate of basal dressing, (200 lb. acre nitrogen), applying top-dressing, particularly at the highest rate (120 lb. acre nitrogen), has brought about a reduction in yield. Some of the deleterious effect of the higher nitrogen dressings, as basal dressings, may have resulted from a reduction in the population.

Work on phosphate application has continued, but the College Farm soils react so little to applications of phosphate that it is seldom that any significant difference results from varying rates and methods of application, or from different types of phosphatic fertilizers.

Animal Husbandry. Several pilot trials were continued.

The Hereford herd was fed in winter on urea at the rate of 3 oz. per head, per day, sprayed in molasses on hay derived from fertilized veld. The object was to provide supplementary protein as cheaply as possible, to avoid the necessity of investing capital in winter feeding pens and to return dung directly to the veld. The results, as indicated by health of the animals, calving rate and general condition of the herd, has been far less satisfactory than last year, and it has been decided to discontinue this work with the Hereford breeding herd. The work will be continued using less valuable steers.

The work in connection with seasonal variations in the composition of milk has been discontinued because staff limitations have made it impossible to deal with the material.

The object of the inter-breed feeding trial is to finish the steers off as rapidly as possible for baby beef, comparing the relative performances of the exotic and indigenous animals. The position at the end of September was:—

Breed	Date of Arrival	Weight at Arrival	Weight at 27th September, 1956	Daily Increase
Hereford	15.6.55	330 lb.	867 lb. (471 days)	1·14 lb.
Africander	28.6.55	330 lb.	826 lb. (458 days)	1·08 lb.
Mashona	17.6.55	356 lb.	751 lb. (469 days)	0·84 lb.
Golden Dun	1.7.55	301 lb.	827 lb. (455 days)	1·16 lb.

The steers, six in each group, were fed from arrival until 21st November, 1955, when they went out to veld grazing; they returned to the pens on 1st June, 1956. All groups suffered from the extremely damp conditions in January and February, the Golden Duns being most affected, thus demonstrating their dislike of the high altitude sour veld, compared with their natural sweet veld environment. The steers will go to slaughter in November, 1956.

Poultry research was hampered by the absence of the Lecturer at military training, but sound progress has been made in the building up of stock for future research work.

For some months the College was without any member of staff specifically concentrating on pastures, but the fertilizer grazing trial was kept going, and will be continued for at least one more season. Under the present system of management it is becoming very difficult to utilize all the herbage in the fertilized paddocks and at the same time prevent excessive trampling of the veld. It is hoped to undertake a frequency survey in the coming season to record species composition of the veld, which has undoubtedly changed. Twenty-one animals were slaughtered off the trial in the period under review and indications were that the Nil treatment was profitable, the N_1PK treatment would show a profit in a good year but the N_2P_2K treatment was not economic.

Engineering. The cattle handling yards and pens, designed by the engineering staff and constructed in metal and concrete have had a winter's test and proved very satisfactory. The crop-sprayer, designed and constructed at the College withstood a season's testing very satisfactorily. A replica is being made for the Sabi Station. Various implements were demonstrated and tested.

Laboratory. For the first time protein determinations of feeding materials have been made in the College laboratory.

HENDERSON RESEARCH STATION

DR. J. W. ROWLAND
Officer-in-Charge

Introduction

The Henderson Research Station lies in the centre of the maize growing area of Mashonaland and serves some 10 million acres of land bounded by the line from Miami to Darwin in the north, and from Mrewa-Mtoko to Gatooma in the south. Of this land, some three-quarters are estimated to be in the European farming area. The Eighth Report on the Agricultural Production of European Farmers, 1953-54, shows that three-quarters of the maize, more than half of the tobacco, and roughly two-thirds of the miscellaneous crops produced in Southern Rhodesia are grown in this area. Something of the status of the livestock industry also is indicated by the fact that one-quarter of the dairy cows and one-fifth of the total European owned cattle are in this area.

The current farming systems are in the main of three types, not closely integrated with one another, although all three may be found on the same farm. These comprise tobacco growing with crops and grass leys subsidiary and subservient to the needs of the main crop, tobacco; maize growing in rotation with green manures and a small proportion of other crops; and lastly, dairy or beef production with inadequate provision for winter feeding being more or less made up by the purchase of expensive concentrate feeds. The bulk of the revenue comes from tobacco, being in the region of £9 million, and maize a poor second worth some £4 million. Some 12,000 dairy cows and 200,000 other cattle may be expected to yield meat and milk to the value of £2½ million. The potentialities for the development of irrigation are considerable, but apart from small scale pasture and vegetable areas, and a very few spectacular large scale estates, farmers are thus far reluctant to commit themselves to irrigation. Farms are large, generally in excess of 3,000 acres.

With an annual rainfall average of 35 inches, and extensive areas of rich loam soils, the region is described by Staples and Murray as being "rarely subject to severe dry spells during the rainy season, and therefore suitable for the intensive systems of mixed farming". The research which is in progress on crops, pastures and livestock, on both dry and irrigated land is bearing out this view. Yields of maize from experimental plots have exceeded 40 bags per acre for two years in succession; sustained high productivity has been achieved on a variety of pastures, on both dry and irrigated land; the culture of pastures has been associated with great improvement in the condition of the

soil, and heavy subsequent grain crops. Ways and means are coming to light whereby exceptionally good crops can be achieved by the use of high plant populations and appropriate applications of fertilizers on land well supplied with organic matter. Erosion studies are showing that water and soil losses can be reduced to negligible proportions even on sloping land under continuous cropping. The animal production experiments are showing that there are good prospects for economic and intensive milk and meat production, if proper attention is paid to the setting up of an appropriate forage flow from veld in spring and early summer, grazing pastures in late summer and winter, with adequate reserves of protein and carbohydrate stored as silage, hay and grain for winter. Pastures and crops whereby this can be achieved are becoming available.

The above studies are all analytical in nature in that they are directed towards the greater understanding of one or other part of land use or farming, such as the factors involved in animal growth, crop yields, forage production and utilization, pasture improvement, or the effects of various forms of land use on the soil and water relations.

The results of some of these investigations are of immediate use and applicability to farming, as for example the discovery of a heavy yielding legume grain crop, the breeding of a better adapted type of animal, the discovery of an effective and cheap feed additive, or a new veterinary remedy. Other results are however not so easily incorporated into the farming picture, although the desirability of doing so is realized and widely extolled by both research and advisory services. For instance, farmers engaged in maize and tobacco production in the usual manner have great difficulty in developing pastures and changing over to ley rotations and other powerful means of improving soils and productivity. The reason is to be sought in the fact that pastures, crops, livestock, and soil welfare are interacting and interdependent, and in consequence the problem of integrating pastures, crops and animals into systems appropriate to the economic, climatic and soil conditions is a most intricate one. Hitherto it has been left discreetly to farmers and advisory services as a mere matter for advice and in rare cases for whole farm demonstration.

The pattern of difficulties experienced in pasture development has been consistent and unchanging throughout two decades, and has proved beyond reasonable doubt that the problem of land use is one richly deserving systematic and detailed long term study, not only at the economist's desk, but in the field as well. The achievement of proper land use entails the putting together of existing sectional knowledge into workable systems of farming which conserve soils and fertility, meet the requirements of production, conform with the availability of capital, credit and labour, and above all give the farmer a reasonable livelihood.

Times without number attempts to introduce better livestock, to incorporate pastures or to raise fertility levels by the use of fertilizers on ley pastures have failed through lack of appreciation of a workable point of balance between such variables as the marketing and transport facilities, the price and availability of fertilizers, the capital and credit facilities, and the amount and price of land. Research needs to be caried out in this rapidly developing country into various forms of land use at a number of levels of capital, fertilizer and labour input, aiming in one case at intensive production, using for example dairy cows, and in another with less ambition, at lower production from beef animals.

The African farmed land needs these studies no less than the European farmed areas, and experimental unit systems that are applicable to African peasant holdings and village communal agriculture can and should be given close study, since conditions and farming practice will inevitably be along somewhat different lines from European farming practice.

In the past, the evolution of systems of land use has been left to chance, trial and error over the ages. Modern times, machines and the pace of change in the agricultural pattern do not permit of such a slow process any longer. Mistakes resulting from having omitted to try out, elaborate and perfect new forms of land use which have been made possible by modern discoveries, and which can meet the increasing demands from the land, will prove both costly and dangerous.

Some years ago a start was made to elaborate an integrated pasture, ley, crop and dairy unit on dry land. It is the merest contact with the far bigger problem of land use as a whole, since only a fraction of the farms can at present be developed to this arbitrary level of capital input, productivity and fertilizer practice; and since higher farming with the use of irrigation, lower farming with beef cattle, small peasant holdings on dry land and the many alternatives between are all equally in need of practical research scrutiny, but funds and facilities are not yet available.

Fish Production

Introduction. The increase in interest by farmers and others in fish resources in farm dams, larger dams and ponds has been again notable this year. Only by a special effort on the part of the fisheries staff has it been possible in some measure to keep up with calls on time, energy and resources on tasks away from the Experimental Fish Farm. Commercial fishing on Lake McIlwaine is now established and in many areas intensive fish raising in ponds has been started. When there is any question of priority in these matters first call is given to research in order to keep abreast of the very full programme that we have set ourselves.

Organization. The aim of co-ordinating and directing Fisheries activities in the Colony has been followed. This necessitates close liaison with other Government Departments, Farmers'

Associations, sporting and recreational bodies and research centres in other parts of the African Continent.

Experimental Fish Farm. All ponds on the Experimental Production and Research Sections are built and comprise 210 units plus concrete or brick tanks for various purposes. Final points in the water and drainage system are being completed. The 20 acres of fry production ponds are still to be built when funds and facilities are available.

Research. A full scale programme of research is under way. By the end of the year (1956) all available ponds will be mobilized to this need. A total of approximately 4,500 lb. of fish has been stocked. Four kinds of *Tilapia* are under investigation. Yields of 4,000 lb. per acre per annum have been achieved by monoculture of *T. mossambica* without feeding or artificial fertilization, but using ducks (1 duck to 10 sq. yds.). Special attention is being given to experiments in larger dams in various parts of the country. Observations on natural and artificial waters are continuing as a routine.

General. The following points are of interest:—

(i) The Chief Fisheries Officer and Fisheries Officer attended the Second Symposium on African Hydrobiology and Inland Fisheries at Brazzaville in July, 1956. Two papers were presented to the Conference.

(ii) A Course for Conservation and Extension Officers was organized in November, 1955. This lasted a week and was held at Henderson Research Station.

(iii) A paper on the feeding of fish to poultry has been published in the *Rhodesia Agricultural Journal* by the Chief Poultry Officer. This is based on experiments carried out on the Fisheries Section.

(iv) A paper on the culture of *Tilapia* in dams has been published in the *Rhodesia Agricultural Journal* by the Chief Fisheries Officer.

(v) An exhibit of the fish potential of Lake Kariba was staged at the Royal Agricultural Show, Salisbury.

Research on Crops

Research has been continued and developed in the growing of crops other than tobacco. Crop rotation, soil preparation, plant espacement, fertilizer practice and weed control are being studied in relation to maize and legume crop yields and the maintenance of soil fertility. At the same time, the production of the single cross hybrid maize seed was continued.

Maize Rotation Experiment. In order to investigate alternative methods of maintaining soil fertility under continuous cultivation with maize as the main crop, three rotations are in progress:—

(a) A three-year rotation of legume hay, maize, maize.

(b) Maize continuously year after year.

(c) Maize followed by legume green manure.

Two populations of 9,680 and 14,520 maize plants per acre are on trial with appropriate fertilizer dressings and trash and manure replacements. Good maize yields, between 23 bags and 28.9 bags per acre have been maintained in the third year of the rotations. The highest yield of 28.9 bags was obtained from the third successive maize crop in the continuous maize series.

Hybrid Maize Seed Production. During the year, 94 acres was devoted to the production of single cross hybrid maize seed, the bulking of inbreds and of Hickory King seed. The total yield of single cross and inbred maize seed was 311 bags, valued at £6,220.

Hybrid Maize Variety Trial. During the 1955-56 season two open pollinated varieties of maize, Hickory King and Southern Cross were tested with three double hybrids, S.R. No. 1 hybrid, S.R. No. 6 hybrid, and S.R. No. 8 hybrid, and one single hybrid, 50H35.

The hybrids outyielded the two open-pollinated varieties. There is no significant difference between the yields of the hybrids.

Legume Experiments. The common legumes used in the maize producing areas as green manures for soil restoration and as high protein feed for cattle are becoming more difficult to grow on account of increasing incidence and intensity of insect damage and of stem and leaf diseases, and the making of good legume hay from them is generally precarious and often impossible due to untimely and excessive rains.

Small plot field trials with certain varieties were carried out as a preliminary to a more critical study of these problems. The following observations were made:—

Cowpeas. Early planted cowpeas, established in close rows at a comparatively high seeding rate, were capable of producing in 10 to 12 weeks, up to 12 tons of excellent green material which could be conserved as high protein silage; under the particular conditions however, a delay of 3 weeks in planting resulted in two-thirds reduction in green-matter production.

Late, mid-January planting of the varieties under test made very slow growth, flowering was prolific in the early plantings, but due to the attentions of a black and red striped beetle, few pods were formed and little seed was made.

Soya Beans. High yields both of green (silage) material and of seed were obtained by close spacing and heavy seeding; of the 5 Hernon varieties tested, 4 produced up to 12 tons per acre of green material, and the seed yields, which varied little between varieties, were of the order of 12 to 15 bags (200 lb.) per acre. This top seed yield is some 5 bags higher than the maximum yield of soyas so far recorded in this country.

The effect however, on plant growth and seed production of planting soya beans late in the season (second half January), was most marked, green material and seed yields being reduced to 5 to 6 tons and 4 to 5 bags respectively.

No disease of any kind was observed on soya beans, and insect attack was limited to occasional termite damage.

Velvet Beans, Dolichos and Groundnuts. Variety and time of planting trials on velvet and dolichos beans also demonstrated the necessity of early planting for high yields, whereas time of planting up to the end of the year did not affect the yield of groundnuts.

Research on Irrigation

In the past year a start has been made with research on irrigation. Work was started on the preparation of 100 acres of Lands 3 and 12. Irrigation by various spray techniques, furrows, in beds and flood will be tested, and the necessary piping and mechanical equipment are being installed. The first requirement in any research project in irrigation is the proper and thorough preparation of the land to receive the water. Great care is being taken with this, and the coming year's plot work will be largely exploratory and preparatory. The other and obvious essential in irrigation work is an unfailing supply of water. This can be furnished by the Dessura or the Gutu rivers if a dam for conserving floodwater is constructed in any one of three possible sites. The capital cost for 100 acres of irrigated land would be in the region of £10,000, or £10 per acre.

A long term programme of experiments and developments has been prepared and approved by the Research Advisory Committee, for this branch of the Station.

Research in Diversified Farming on an Intensive Farm Unit

On this Unit, the aim is to produce economically 30 lactations of 600 gallons and a maize crop for sale of 500 bags, from up to 230 acres of natural and improved pasture and 70 acres of arable land. The arable land is divided into 10 seven acre sections comprising 28 acres of maize, 28 acres of pasture and 14 acres of legume for forage. The arable land is farmed on a 10 year rotation with a yearly sequence of four years of grass followed by six years of crops in the sequence maize-maize-legume-maize-legume-maize and back to grass. Experience is being gained with the technique of recording cost accounting, scale of operation and team work between a Committee consisting of the Finance Officer, Federal Ministry of Agriculture, two farmers with a wide experience of dairy farming, costing and local agricultural practice, and the Officer-in-Charge.

During the year under review the Unit was improved by the establishment of some 15 acres of Rhodes Grass pasture for summer and autumn grazing. The fencing and general management suffered from the construction work on the main road. A number of teething troubles have been overcome, including difficulties with gettings the cows in calf, and lumpy skin disease which interfered with the grazing of the Napier in the autumn. Attempts to use oxen instead of a tractor proved locally impracticable.

A good crop of Jack bean was grown for forage and a fair legume hay crop was put up on tripods for winter consumption. The maize crop exceeded 500 bags and 120 tons of green fodder was cut for silage. Good results were obtained by early spring grazing of the Napier, which allowed better growth of legumes sown after the rains between the grass rows.

The physical condition of the soil after the grass ley, has improved to a remarkable extent, and the best maize was grown on the first and second maize crops after the grass.

Research on Pastures

The programme of experimentation on Giant and Australian Rhodes Grass, Star, Makarikari, Panicum, Kazengula Setaria, Sudan and Napier Fodder has continued. The main object of this work is to ascertain how best to achieve a positive sequence of grazing from early January when the veld loses its feeding value, to May. The experiment continues then through autumn and winter by means of a series of comparisons of different feeding rations from pasture and other hays, silages and forage grazings, supplemented with concentrates such as cotton seed, Jack bean, urea and molasses.

Summer Grazing Pastures. The summer grazing pastures under test this year have been Giant Rhodes, Star, Nyasaland Napier, and Australian Rhodes Grass. The fertilizer treatments throughout were 200 lb. superphosphate and 400 lb. sulphate of ammonia per acre. This latter was applied in four equal dressings of 100 lb. at monthly intervals. No great differences were apparent between the cattle weight gains made on the different grasses, the average being approximately 250 lb. in-

crease for the summer period. The approximate stocking rate on this level of fertility was two beef steers per acre.

Using the same grasses but at a lower level of fertilizer application, i.e. 200 lb. superphosphate and 200 lb. sulphate of ammonia per acre, the summer weight increases were about the same as on the higher level of fertility but in this case the stocking rate was one beast per acre.

Autumn Grazing and Silage Pastures. The grasses used in these studies were Giant Rhodes, Makarikari, Bambatsi, Gold Coast Napier, Sudan and Kazengula Setaria. The fertilizer applied was 200 lb. superphosphate and 400 lb. sulphate of ammonia per acre. The latter was applied in one dressing of 200 lb. at the beginning of the season, and was followed by two 100 lb. dressings after the first silage cut. The average production of green matter per acre in two cuts was approximately 6 tons.

Autumn grazing treatments were applied after the two silage cuts had been taken. Weight increases of about 1 lb. per day were obtained at a stocking rate of one beast per acre.

Using some of the above grasses at a lower level of nitrogenous fertilizer application, the silage yields were lower (3 to 4 tons per acre). Autumn grazing responses were similar to those obtained with the higher fertilizer treatments.

Winter Feeding. Silage made from the above grasses was used for winter feeding. Three types of protein supplementation were imposed on the basic ration of silage and stover. These were 1½ lb. cottonseed cake, 2½ lb. Jack bean and 3 oz. urea per day. The approximate weight increases per steer per day on the above treatments were respectively ¾ lb. per day, ½ lb. per day, and ¼ lb. per day.

Irrigated Pastures. Ten acres of red soil under two year old pastures have been tested in the past 12 months. The mixed Italian rye grass, Phalaris, fescue, lucerne and clover pasture has maintained its vigour reasonably well through its third winter. The rye grass has largely disappeared, leaving mainly fescue and clover. A small hay crop was cut in the summer, and good midwinter grazing was provided to five steers per acre each afternoon for three hours. The steers for the rest of the day were kept in a kraal and fed a basal winter ration of silage and stover.

The mixed *Paspalum dilatatum* and clover pasture grew exceptionally well in spring and summer and autumn, but tended to be poor in winter, in spite of irrigation. Good silage was made from two cuts in the summer, and the aftermath was grazed through late autumn.

The Kikuyu and clover pasture was outstanding in the past summer yielding two heavy silage cuts of 10 tons each and then growing again to give a great mass of autumn grazing. It grew weakly in winter, however, doing little until the end of September. The irrigated Napier proved unsatisfactory and was ploughed out.

Legume Seed Production. The following legumes were grown for seed production: *Desmodium discolour, Desmodium tortuosum, Teramnus uncinatus* and *Glycine Javanica. Canavalia ensiformis* (Jack Bean) was grown on a large scale for the production of cattle feed and the yield of seed was as high as 15 bags of 200 lb. per acre.

Research on Animals

Digestion Studies. The digestibility of thirty feed samples either as single roughage feeds or combinations of feeds was determined during the past year. These included fortnightly herbage samples of veld grazing and fertilized Rhodes grass ley pastures, silages, legume hays, and low quality roughages with supplements.

Although the chemical analyses of the feed samples lags far behind the actual digestion trials, valuable basic information is being obtained from this work on the nutritional value of most of our common winter feeds as well as the pattern of digestibility of the veld and fertilized pastures. One factor of prime importance which has been brought to light by this type of experimentation has been the inherent deficiency of protein in most of our feeds. This presents one of the most important factors governing animal production in this area and is a subject which should be fully investigated.

Herbage Intake Studies. One of the weak links in nutritional investigations and pasture evaluations in the past has been the lack of accurate data on the feed consumption of animals under grazing conditions. New techniques have been developed lately involving the use of inert tracers to determine total faecal excretion and making use of the correlation which exists between the nitrogen concentration of the faeces and the digestibility of the organic matter in the feed. By this method accurate estimates of the herbage intake are obtained. Trials have been in progress during the past year to test the validity of these techniques and although complete results are not yet available this approach to pasture evaluations shows considerable promise.

Breed Comparison of Africander and Angus Cattle. This work has now been in progress for the past three years. It is difficult to draw comparisons at this stage although the following observations have been noted from the data:

(i) The calving rate for the Africanders has been approximately 85% while that for the Angus is about 70%.

(ii) Weaning weights differ significantly between the breeds. The Africanders weaning out at between 50 to 100 lb. heavier at 8 months than the Angus.

(iii) Routine recording of the rectal temperatures of the young stock of these two breeds during the last summer revealed the fact that the Angus cattle regularly exhibited abnormal temperatures of from 103 to 105 degrees F.

The Utilization of Low Quality Roughages. A start has been made on this very important aspect of ruminant nutrition. Preliminary results only are available from one season's work but these show considerable promise. It is hoped that this work will be expanded next season.

From the results so far, it appears that with correct supplementation low quality roughages can be of considerable value for beef production. The main deficiencies appear to be: protein (or a certain amount of non-protein nitrogen); small amounts of readily available carbohydrates; trace elements and vitamin A and low palatability.

By taking the above facts into consideration, several rations were calculated for weaners, yearlings and 2½ year old fattening steers. The roughage used in these rations was maize cob. Molasses was used to provide the readily available carbohydrate and to increase palatability. Protein rich cake, legume seeds and legume hays were used to provide a part of the protein requirements, while urea provided the remaining 50%. Vitamin A and trace elements were added to provide the animals' requirements.

From this work it appears that these rations proved as effective in promoting growth in all classes of stock as the conventional rations and in certain circumstances they were far superior.

Development. Approximately 8 miles of fencing have been erected on the veld grazing areas and a new section for the study of the influence of nutrition on the fertility of beef cows is in the process of being developed. Installations include 2 boreholes, pumps, water troughs, sorting and feeding pens; 100 individual feeding pens for progeny testing, one spray race, a weigh bridge and a store room.

Erosion Control Research

(This work is carried out by the Department of Conservation and Extension in collaboration with the Department of Research and Specialist Services).

The work described above consists of the assessment of the production potentialities from the land in the form of crops, pastures and livestock. Production from the land and the removal of farm produce tends to draw on the fertility reserves of the soil, and hitherto in the sub-tropics serious soil depletion all too often goes hand in hand with the conversion of virgin grass and woodland into farms. In order to have a firm knowledge of the basic causes and processes involved in soil deterioration, under farming practices, experiments have been devised by the Department of Conservation and Extension to show how much water and soil is lost from various crops, from land under different forms of cultivation and from pastures on different soils on commonly found slopes.

The progress made in the past year is reported on by the Director of Conservation and Extension.

Estate and General

Four rondavels were built for European bachelor accommodation, and temporary improvements were made to the offices in the barns. Roads were maintained and re-aligned to suit the newly tarred main road.

Two new transformers were installed to supply the Fisheries Section and to replace the one at the farm buildings which was unable to take the load. The Public Works Department wired five houses, three bachelor rondavels, the offices and lecture hall.

The Irrigation Department provided a new borehole to increase the water supplies to the ring main, and an elevated 5,000 gallon reservoir with an electric pump ensured sufficient water to the six houses and offices in the region of the farmyard.

Two new houses were built by the Department of Conservation and Extension for the Group Conservation Officer and the Extension Officer.

At the Royal Show, an exhibit was designed to show a series of nutritional plans for feeding various classes of livestock throughout the year. The Fisheries exhibit included a model of the Kariba Dam giving details of its potentialities as a source of fish for the Federation.

No general annual Farmers' Day was held this year, but the number of visits exceeded the 1,200 recorded in previous years.

Publications issued this year include pamphlets on fish culture, land use, maize growing, pasture development on maize farms, digestibility of feedstuffs, steer feeding experiments, the fertilization of pastures, and six papers on erosion control research.

The Henderson Research Station Agricultural Scientific Society has been formally constituted on an annual subscription basis. Five meetings have been held.

Revenue from the sale of produce has been in the region of £9,000 made up of £6,220 for hybrid maize seed, £1,000 for milk, £1,500 for livestock and £600 for miscellaneous sales including fish.

GRASSLAND RESEARCH STATION

DR. O. WEST
Officer-in-Charge

Grasslands Research Station at Marandellas is the Regional Agricultural Research Station for the sandveld of the high-lying north-eastern part of Southern Rhodesia. Attatched to it is the sub-station at Melsetter which serves the Eastern Districts.

Weather

Rainfall. The first good fall of 0.82 in. occurred on 15th November. Rainfall was fairly well distributed though conditions were droughty in the month of January. The total for the season was 38.92 in., 2.77 in. above the mean for the previous 22 years.

Temperatures. The absolute maximum screen temperature was 90.3 degrees F., recorded on the 14th November, and the absolute screen minimum temperature was 31.0 degrees F., recorded on 12th August. The absolute ground minimum temperature was 15.3 degrees F. recorded on 13th August.

Station Development

Thirty acres to the west of the dairy block was cleared for the farm maize crop in the 1956-57 season. Seven acres to the west of the tower silos were prepared and planted to Kazungula Setaria.

Irrigation from the Jack White Dam. The pumphouse was completed and electricity laid on. Velvet beans were planted for green manure during the summer on the 23 acres prepared during the 1955 dry season. Pastures under irrigation were established on this area from May, 1956.

The remainder of the forty acres that it is intended to irrigate was stumped and ploughed during the 1956 dry season.

Buildings

Staff Quarters. No new houses were built during the year. Government leased a house in Marandellas as staff quarters owing to the shortage of houses on the Station. Bachelors' quarters which till September, 1956, were occupied by married staff, are now occupied by two bachelors.

African Housing. Four houses were completed during the year, three of which are in the African village, and one in the African staff area. Four others are nearing completion.

Farm Buildings. A new building, 180 ft. x 25 ft. 6 in., combining seed stores and a haybarn, was completed but for plastering. The implement shed and workshops, built in the previous year, were wired for electricity, but not connected to the mains pending relocation of a transformer by E.S.C. The offices are being extended to provide facilities for a chemist.

Tree Planting. Five acres of gum and one acre of pines were planted below the Jack White Dam. Three-quarters of a mile of pine, four rows wide, were planted to form one side of a proposed avenue to the west of the Hunyani vlei. A row of Chilean poplars was planted as a break to the north of the farm sheds. Ornamental trees and hedges of cypress and bouganvillea have been planted to improve the setting of the offices.

Farm Crops and Fodder Conservation

Maize. Thirty acres of maize were planted on second-year land after a crop of velvet beans had been taken for silage in the previous season. The crop received 150 lb. superphosphate per acre at planting and 200 lb. ammonium sulphate per acre as a top dressing five weeks later. The yield was 18 bags per acre.

Fodder Conservation. About 1,100 tons of grass silage, with which was included a small proportion of velvet beans, were conserved during the 1955-56 season. 1,060 bales of star grass hay were made.

Livestock

Dairying. The high-grade Friesland herd increased to 30 cows in milk, with a slight increase in young female stock. The herd sire, Dagmar, was replaced by a bull purchased from Mr. T. Murray of Graaff Reinet. A bull on loan from Gwebi Agricultural College was also used.

Average production for the year is shown in the following table:—

Class	Number in average	Milk lb.	Butter-fat %	Butter-fat lb.
Mature Cows	15	10,310	3·51	361·6
Heifers	7	6,741	3·73	251·7
TOTAL	22	9,174 (av.)	3·61 (av.)	331·2 (av.)

Beef

Shorthorns. The breeding herd was culled, reducing it to 39 breeding cows. An excellent calving percentage of 93% was obtained. Average weaning weight of calves was 400 lb.

Afrikanders. Fifty heifers were acquired for use in a fertility trial. A bull was transferred from Matopos for use later in the trial.

Herefords. Thirty heifers were transferred from Matopos for future work in light-intensity trials.

Steers. Forty Hereford and 60 Afrikander steers were purchased through the C.S.C. and 90 steers were sent for slaughter during the year.

Sheep

German Merino rams were used on all breeding ewes, which now number 100.

Crop Research

Maize. For some years past the Station's activities have centered in developing a system of ley-farming for the sandveld. The present series of experiments with maize is the beginning of the study of the arable phase of the system. In the 1955-56 season it was possible, for the first time, to test crop production after a ley.

Maize as the first crop after a well-fertilized star grass ley gave, without fertilizers, 25.8 bags per acre, whereas similarly treated maize on old land nearby gave but 9.9 bags per acre. At present prices the difference in yield of 15.9 bags per acre alone is about equal to the cost of the 2,100 lb. of ammonium sulphate per acre applied to the ley over the course of its life.

The central importance of nitrogen in the practical management of sandveld soil is common knowledge. This season's work emphasizes the importance of learning how best to use it.

Where the ley was ploughed in March, the maize yield without nitrogenous fertilizer was 25.3 bags per acre; where the ley was broken for the first time in October, the yield was 15.7 bags per acre. The rate of response to ammonium sulphate was, however, smaller after the early ploughing than after the late ploughing.

While the general level of yield of maize-after-ley was high, rates of response to the various treatments applied were much the same as those found in our experiments on non-ley land. In other words, there is no evidence so far to suggest that maize needs be treated differently on land which has been down to a well-fertilized grass ley.

Variety trials have shown once again the greater yielding ability of the hybrids developed on the Salisbury Experiment Station, as compared with the locally-grown, open-pollinated varieties, Hickory King and Southern Cross. The average yield of the former, over all experiments, was 28.4 bags per acre, and of the latter 22.5 bags per acre. The hybrids are found to be more responsive to ammonium sulphate and more tolerant of a high plant population.

Studies of planting density have tended to confirm the view that the optimum plant population is between 12,000 and 15,000 plants per acre.

Experiments with superphosphate confirm the view that a dressing of 200 to 300 lb. per acre will, as a general rule, meet the needs of a maize crop on sandveld.

Rice. Eleven varieties of rice from native reserves were tried on a very small scale in a vlei. Muterego White from Chiota and Dembarembe Mutsaka from Chikwaka appeared the most promising.

Pasture Research

Veld Studies

Grazing of fertilized veld. In this experiment veld is fertilized at four levels, viz. 0, 300, 600 and 900 lb. nitrolime per acre per year. Uniform dressings of superphosphate and muriate of potash are given in the treatments where nitrogen is applied. The response to fertilizing is measured in terms of steer live-weights, the stocking rate being adjusted during the grazing season to maintain, as far as possible, even grazing pressure in all treatments.

The following table summarizes the results for the 1955-56 season:—

Amount nitrolime per acre: lbs.	Live-weight gain per acre: lbs.
0	143
300	316
600	398
900	390

The gains per acre were obtained by increasing and decreasing the socking rate to make full use of growth flushes. They could not have been obtained with a constant stocking rate.

Isolation transect. The treatments in this experiment have now been applied for four seasons. Point quadrat analyses show that the botanical composition of the areas which have been heavily grazed for four seasons is changing. Couch grass (*Cynodon* spp.), *Heteropogon contortus*, *Eragrostis patens*, *Chloridion cameronii* and *Digitaria gazensis* are increasing and there is a corresponding decrease in *Hyparrhenia filipendula*, *Eragrostis chalcantha*, *Rhynchelytrum* sp., *Andropogon* spp., *Digitaria brazzae* and *Brachiaria brizantha*.

Grazing Management: Three herds in four paddocks. The groups of steers which had grazed in the experiment since its inception on 18/11/1955 were slaughtered on 9/5/1956.

The results are summarized in the following table:—

Stocking Rate	Mean live-weight gains	Grading of carcases at slaughter			
		R.B.	Imperial	Std. A	G.A.Q.
1 steer to 14 acres	482 lb.	2	2	5	—
1 steer to 10 acres	415 lb.	3	2	4	—
1 steer to 6 acres	395 lb.	1	4	2	2

Examination of the weight records showed that the live-weight gains during the growing season are similar in all groups, but that during the dry season the animals grazing at the lightest stocking rate did not lose as much weight as those in the treatments stocked at the rate of 1 steer to 10 and 1 to 6 acres respectively.

Two-year-old Afrikander steers of the same type were used as replacements.

Tree poisoning. Trials involving the use of the chemicals Karmax W and Ammate on Msasa and Mnondo trees and coppice were carried out in co-operation with Messrs. Pest Control (Central Africa) Ltd. The results have so far been negative.

Veld defoliation. In a factorial experiment veld plots have been defoliated by mowing during various periods of the year for four years. The experimental area was mown in September, 1956, and the effects of the differential mowing treatments on botanical composition will be assessed by harvesting species separately in the 1956-57 season.

Plant Introduction and Nursery Work

Grasses. Of the large number of recently collected grasses in the Plant Introduction Nurseries a selection from *Panicum maximum* collected originally in the Sabi, and which is showing particular promise, has been bulked up for large scale field trials which will commence in the season 1956-57.

Attention is being devoted to creeping strains of *Echinochloa pyramidalis* as well as a *Brachiaria sp.* and a *Vossia sp.* which show promise for use under irrigation in hot areas. A large collection of *Eragrostis spp.* (Love grasses) is being studied.

Legumes. A collection of African clovers together with specific strains of *Rhizobium* was recently obtained from Kenya. Former attempts to grow these clovers have always failed because it was found that the strains of *Rhizobium* available locally were ineffective.

A collection of *Cajanus indicus* (dhal) from various parts of the world is being assembled in a search for varieties more tolerant of frost.

Fertilizer experiments on cultivated grasses. A series of experiments designed to study the effect of applying sulphate of ammonia in different sized dressings and at different times was initiated in the 1955-56 season.

In two experiments on Kazungula Setaria and Katambora Rhodes Grass a total of 400 lb. of sulphate of ammonia per acre was applied in four ways, viz. all at the start of the season; two equal dressings, four equal dressings and eight equal dressings. Yields were measured by harvesting twice in the season.

It was found that as far as total seasonal herbage yields are concerned, there was no advantage in splitting dressings, and yield was reduced as fractionation was increased. Where however, all the fertilizer was applied at the start of the season the yield in the first cut was two to three times the

yield in the second cut. Where equal amounts of fertilizer were applied per cut, the results differed for the two grasses. The yield of Katambora Grass in the second cut was approximately double that in the first cut, while the reverse was true for Kazungula Setaria.

An experiment was conducted on Star Grass to determine the effect of applying varying quantities of sulphate of ammonia at different times.

Herbage yields and the crude protein content of the herbage were measured. The results showed that the effect of any particular dressing at any time was independent of the size of any previous dressings and the time at which they were applied. The general response to nitrogen measured in terms of herbage yield, crude protein content, and crude protein yield was in all cases linear. The herbage yield response in a midseason cut was greatest when the fertilizer was applied at the start of the rains, while the increase in the crude protein content was greater as the time interval between the application of fertilizer and cutting lessened. The crude protein yield response was similar for all times of application.

The effect of dressings of sulphate of ammonia applied at different intervals before cutting on the crude protein content of Star Grass was studied in a further experiment. The crude protein determinations are not yet complete. From the results available to date it appears that, under the conditions of the experiment, the maximum increase in crude protein content was obtained approximately one week after the application of sulphate of ammonia.

Experiments involving a comparison of the yield response of different grasses to fertilizing with sulphate of ammonia at three levels, viz. 300, 600 and 900 lb. per acre per year have been initiated.

The following grasses will be compared: Kazungula Setaria, Katambora Rhodes Grass, Grasslands Cenchrus, Sabi Panicum, Bambatsi Panicum, Star Grass No. 2 and *Eragrostis curvula*. The grasses were established during the 1955-56 growing season under uniform fertilizer treatment. The first measurements of the response to varying levels of nitrogenous fertilizing will be made in the coming season.

In an experiment on Napier Fodder which has now completed its third year, three row spacings, three levels of fertilizing with ammonium sulphate, and three frequencies of cutting were applied.

Row spacings of 6 ft., 9 ft. and 12 ft. had little differential effect on yields. Ammonium sulphate at 600 and 900 lb. per acre increased dry matter yields one-third above the yield obtained from 300 lb. per acre, but this increase was not statistically significant. It was observed in the previous season that the ammounium sulphate treatments had a markedly greater effect on the crude protein content than on the yield of dry matter. The protein analyses for 1955-56 are not available at the time of writing.

The effect of cutting frequency on dry matter yield is given below:—

	Number of cuts taken in the third season		
	1	2	3
lb. Dry Matter per acre	11,200	10,900	4,900

Two fertilizer trials on Star Grass have been carried out over 4½ seasons. These were yielded twice a season—about the middle of January and towards the end of March.

Large and consistent responses to ammonium sulphate applied at rates up to 900 lb. per acre per season have been obtained in all cuts.

300 lb. of super/raw-rock phosphate applied at the beginning of each season, has produced a consistent increase only in the first yield cut of each season, and this has become more marked in subsequent seasons. A favourable interaction between ammonium sulphate and super/raw-rock phosphate in the first yield cuts has also become increasingly significant.

Potassium chloride up to 225 lb. per acre per season has had little effect on yield.

Agricultural lime at 1,000 lb. per acre per season has not had a consistent effect, but when dressings were increased to 2,000 and 3,000 lb. yields were consistently and considerably depressed.

These experiments were ploughed in January, 1956, for test-cropping with maize in the 1956-57 season.

Pasture Legumes

Lucerne Variety Trial. This trial is a comparison of 22 varieties of lucerne. Yield figures were obtained for the 1955-56 season but because of soil variation no definite decision can be made as to which varieties are best. The following varieties appear to be among the best: African, Hairy Peruvian, Grimm Common, due Puits, Buffalo, Vernal, Caliverde, Atlantic.

All varieties were badly affected by leaf spot in the mid-growing season. Lucerne caterpillar proved troublesome in the late season.

Dahl Variety Trial. Ten dahl varieties are being compared in a trial started in November, 1955. It was hoped to find a suitable variety which is less sensitive to frost than the variety at present in use on the Station. As no severe frosts occurred at the site of the trial, no information on this aspect has yet been obtained.

Lucerne nutrition. A mixture of 21 lb. of borax and 5 lb. of potassium iodide per acre brought about a large increase in the yield of lucerne grown under dryland conditions, but whether one or both of the ingredients was responsible has still to be determined. Superphosphate also increased yield, the more so when applied jointly with the borax/iodine mixture. There was a steady increase in yield over the range of ammonium sulphate tested (0-600 lb./acre).

Vlei legumes. White clover planted on vlei land in 1953 has persisted well and is still present in pure stands. Further seedings on selected sites have also been successful.

Legumes on dryland. A lucerne/Grasslands Cenchrus mixture is very promising. This pasture was established by seeding lucerne in 3 ft. drills late in the 1953-54 season, and overseeding the grass in the early 1954-55 season.

Dahl has proved to be a valuable dry season protein supplement. It can either be planted in "hedgerows" through pastures, or as a pure stand. A pure stand was established on thirty acres. During the dry season Shorthorn cows on a nearby Giant Rhodes pasture were allowed access to the dahl, and made excellent use of it. Yearling Afrikander steers grazing on veld, however, had to traverse a long corridor to graze the dahl, and did not take to the arrangement satisfactorily.

A very satisfactory mixture of red clover and Star Grass was obtained by seeding red clover in December, 1955, on a Star Grass ley ploughed in mid-November. This pasture provided valuable grazing for sheep particularly in the late growing season. An encouraging feature is that the red clover has not died during the dry season.

Animal Husbandry Research

Milk Production from Pastures

Dry-land summer pastures. The dairy herd grazed Katambora Rhodes Grass and Kazungula Setaria pastures from 1st December to 31st March. During this period three groups of four cows each were used in a cross-over design to determine the level of production from the pasture. Supplementary feeding of 1½ lb. and 3 lb. of dairy cubes per gallon to cows giving three gallons or less per day, did not increase production above that obtained without supplementation. Cows receiving no concentrates gave up to four gallons each per day during December.

Irrigated grass/clover pastures. Soilage from an irrigated grass clover pasture fed at the rate of 4 lb. dry matter per gallon of milk produced and dairy cubes fed at the same rate, were compared in a controlled feeding trial with cows giving up to four gallons of milk per day. Production was similar with both feeds.

Seventeen of the twenty-five acres of new irrigated pasture was established to the following mixture seeded at the rate of approximately 9 lb. per acre:—

Alta Fescue	3·3 lb.
S. 143 Cocksfoot	3·3 lb.
H.1 Ryegrass	1·0 lb.
N.Z. White Clover	1·0 lb.
Chilean Red Clover	0·75 lb.

An important feature of the mixture is the unusually low proportion of ryegrass. In earlier trials, a higher proportion of ryegrass had tended to preclude the establishment of the slower-growing perennial grasses.

The remaining 8 acres was planted to a Ronpha/clover mixture, the grass being planted at a spacing of 12 in. in 18 in. rows.

The pre-planting fertilizer applications were as follows: Two tons agricultural lime per acre; 600 lb. superphosphate per acre; and 100 lb. muriate of potash per acre. In addition 20 cubic yards of kraal compost was applied shortly before planting.

Since planting, 215 lb. nitrolime and 215 lb. sulphate of ammonia per acre have been applied.

Grazing of these pastures by dairy cows started on 10th September, 1956. After the first week, no concentrates were fed to cows giving less than four gallons per day, 3 lb. dairy cubes per gallon being fed above this level. A week later maize meal was substituted for dairy cubes with no reduction in production. As an example of the daily production obtained, 28 cows on this pasture gave 110 gallons of milk, of which 97 gallons were produced without supplementary feeding.

The first 8½ acres grazed produced, in 20 days, 208 gallons of milk per acre without concentrates being fed, and a further 36 gallons of milk per acre for which dairy cubes or maize meal were fed at the rate of 3 lb. per gallon. Milk production from the pasture appeared to be limited more by carbohydrate than by protein.

Research with Beef Animals

Dry season grazing of pastures. A trial designed to estimate the value of various pastures for dry season grazing is in progress. Groups of yearling Afrikander steers are being grazed on (1) Kazungula Setaria, (2) Katambora Rhodes Grass, (3) Grasslands Cenchrus and Bambatsi with hedgerows of dahl, and (4) veld and vlei. Over the four-month period 25th May to 26th September, the mean group live-weight gains per steer were 47, 24, 95 and 8 lb. respectively.

Beef Production from Pastures. Two acres of grass/legume pastures divided into six small plots carried three three-year-old Afrikander steers from 7th December to 7th May, 1956, a period of 152 days. The live-weight production per acre was 346 lb.; the average daily gain was 1.52 lb. per head.

These gains were lower than in the two previous seasons. When brought on to the plots, the animals were younger and heavier than those previously used, and in good condition after wintering on dahl and planted pastures. They reached a peak weight and put on fat. At slaughter on 9th May, two were graded Rhodesia Best and one Imperial.

Five similar steers grazing with the dairy herd, gained 1.48 lb. per head per day; at slaughter, two were graded Rhodesia's Best and three Imperial.

Salt Feeding. No significant difference between groups of Sussex, Afrikander and Indigenous steers with and without salt feeding have been observed. The two groups of Sussex were slaughtered in May, 1956, and two groups of 18-month-old Hereford steers have been included in the trial.

Shorthorn Breeding Herd. The breeding herd of 39 cows and 11 heifers came off the veld on 1st June in excellent condition. From 1st June to 1st September, the fifty animals maintained condition on 36 acres of mature Giant Rhodes Grass, 36 acres of very short aftermath with access to 30 acres of dahl. The dahl was completely grazed by the end of August; silage was fed from 1st September.

Fertility in Afrikander heifers. Differential treatments of (1) no supplement; (2) 1½ lb. groundnut meal per head per day; (3) 6 grammes mono-sodium phosphate per head per day; and (4) 1½ lb. groundnut meal and 6 grammes mono-sodium phosphate per head per day, were started with fifty Afrikander heifers on 1st June. No significant differences in body weight or ovarian activity have been established with these treatments.

Sheep

Grading up to German Merino type has continued. The lambs weaned in January and February, 1956, were of good quality. The average live-weight of 81 lambs at 16 weeks was 61 lb. German Merino ewes belonging to Trelawney I.C.A. have adapted themselves very well to conditions at Grasslands.

Miscellaneous Research Projects

Lysimeters and Run-off Plots. With 38.92 in. of rain during the season, 29.75 in. percolated to depth of 75 in. in sandveld lysimeters kept bare of vegetation, whereas but 12.16 in. on the average, percolated to that depth in lysimeters carrying crops of maize and Star Grass; the loss of water under the crops being 16.59 in. greater than that from bare ground.

As in past seasons, run-off and erosion were negligible on plots with a run of 69 ft. on a 2.7% slope on sandveld soil.

Tree and Grass Root Studies. Root bisects of various pasture grasses and legumes were charted during the 1955-56 season. It was found that the roots of the common ley grasses normally extend to a depth of at least 9 ft. The roots of exotic grasses under irrigation such as Cocksfoot and Fescue extend, however, to only 3 feet.

Of the legumes, dahl was deep rooted (7 ft. and more) while lucerne roots penetrated to this depth in certain situations but to only 2 feet in others. Red clover and *Medicago lupulina* were relatively shallow rooted (18 in.-2 ft.) while the roots of white clover were in no case traced below 9 in. depth.

No root bisects on trees were done in the past year.

Gauging Weir. Measurements of stream-flow and related meteorological observations have been taken in a selected catchment for the Hydrographic Branch of the Division of Irrigation.

Insect Light Traps. A light trap has been operated since November, 1955, on behalf of the Chief Entomologist, mainly for the detection of army worm moths.

Wattle. Twelve acres of land has been made available to the Rhodesian Wattle Company Ltd. for the establishment of a wattle trial.

General

Seed and Root Distribution. Nine varieties of grass seeds, six varieties of legume seeds and eleven varieties of grass roots were distributed. 135 consignments were made.

Advisory Visits to Native Reserves. A pasture research officer visited twenty-four Native Reserves to be proclaimed under the Native Land Husbandry Act. Thirteen weeks was spent on assessing stock-carrying capacity and compiling reports for submission to Assessment Committees.

Farmers' Days. Some 300 visitors attended a Farmers' Day held on the Station on 23rd March, 1956. The proceedings were opened by the Prime Minister of the Federation, the Right Honourable Viscount Malvern.

Visitors. Excluding Farmers' Day, 360 visitors signed the Station's Visitors' Book. This represents about a quarter of the total number of visitors.

Library. During the year the number of volumes held increased from 177 to 294. Numerous periodicals and pamphlets are also received.

Grasslands Committee School. Ninety-one African children attended the Grasslands School which provides tuition up to Standard II. Increase in the number of teachers from two to three is justified but must await the provision of an additional classroom.

Acknowledgements. The Station is grateful to Messrs. Fisons (Rhodesia) Ltd., Messrs. Windmill Fertilisers (Rhodesia) Ltd., and Messrs. African Explosives and Chemical Industries (Rhodesia) Ltd. for very generous gifts of fertilizers.

PASTURE RESEARCH SUB-STATION, MELSETTER

Weather

The season started badly with little rain falling before the last week in November. Thereafter, however, the rains were good with better than average falls in April and May. The total rainfall from 1st October to 30th September was 47.73 inches.

Experimental Work

Dairy Unit. The pastures included in the unit are:—

Dryland pastures

Kikuyu/clover	19·5 acres
Paspalum/clover	1·0 acres
Kikuyu	1·0 acres
Paspalum	2·0 acres
Napier Fodder	7·0 acres
	30·5 acres

Irrigated pastures

Various mixtures of Rye grasses, Cocksfoot, Fescue and Phalaris, with New Zealand Wild White and Chilean Red Clover	6·6 acres
	37·1 acres

These 37.1 acres carried 40 mature Jersey cattle, 5 yearling heifers and 27 sheep throughout the year.

The aim of the unit is to produce butterfat from established pastures cheaply by eliminating, as far as possible, both the feeding of expensive concentrates and the application of highly priced nitrogenous fertilizers. The management is reasonably simple and could be applied under average farm conditions.

The level of production on the unit is reflected in the following figures:—

Milk produced	127,630 lb.
Additional cattle grazing-days	5,043 lb.
Calf grazing-days	2,389
Sheep grazing-days	8,402

Irrigated pastures are rested for three months from mid-January to allow the annuals to set seed and the perennials of the mixture to build up root reserves. In four acres of these pastures the usually short-lived Italian Rye Grass and Chilean Red Clover still provide a considerable amount of the grazing after being utilized for three seasons.

Hoven has rarely occurred during the past four years, even on swards including 75% clover. During December and January, however, six cows required treatment for hoven. The pasture in each case was Kikuyu/Clover.

The low quality of Napier Fodder silage, in spite of good yields, make it desirable that Napier Fodder in the unit be replaced by higher quality pastures—Kazungula Setaria and Katambora Rhodes grass with suitable legumes.

The inclusion in the unit of seed-potato production, to which this area is suited, would enhance the economic return that could be demonstrated. Outstanding yields have been obtained from a potato crop after a five-year grass/clover ley.

Potato Trials. Two potato trials were carried out for the Chief Agriculturist, and a small amount of Foundation Scotch Seed was bulked up for the Eastern Districts Potato Seed Growers' Association. Indications are that potatoes following a ley can achieve outstanding yields if planted before, or early in, December, and if blight-resistant varieties are used.

Lucerne Nutrition. Applications of 300 lb. superphosphate and 1,500 lb agricultural lime per acre both increased the yields of lucerne considerably, and each was more efficient when the other was also applied. Seed inoculation was also beneficial. Eight trace elements (in two mixtures) and potassium chloride induced no significant response.

Veld Management Studies. Different intensities of mowing and different times of burning were continued to determine their effectiveness in controlling scrub and bracken, and in encouraging grass cover.

General

Distribution of Seed Potatoes. Nearly 8,000 lb. of seed potatoes of six varieties was distributed to members of the Eastern Districts Seed Potato Growers' Association for trial.

Hydrological Observations. Weekly recordings of water levels in streams are made for the Hydrological Engineer, Division of Irrigation.

Visitors. Although no Farmers' Day was held, over 300 people visited the Station.

MATOPOS RESEARCH STATION

J. M. RATTRAY

Officer-in-Charge

Staff. Apart from losing four members of the Staff to the Native Department, the position generally has been satisfactory. The Field Husbandry Section now has three professional officers, and a much broader programme of work is therefore possible. With the appointment of a Technical Assistant the development of the Poultry Section has been facilitated as the Poultry Officer can now arrange for supervision of the work on the Station while he is away on advisory work.

Two members of the Staff were awarded scholarships during the year and proceeded overseas (one to the United Kingdom and the other to Australia) for study purposes.

It is felt that a Chemist should now be appointed to the Station to cope with the increasing demand for analyses of fodders and soils.

Native School. This has been successfully functioning since the beginning of the school year with some 65 children attending.

Beer Hall. The Beer Hall unfortunately had to close down after about 3 months as the Natives themselves were quite incapable of running the Hall. Beer was obtained from the Bulawayo Municipality and sold in the Hall. It is apparent that European supervision is required full time for this method to be successful. As this is not possible, brewing under permit is to be introduced.

Climate. In spite of a drought during January and February some 18 inches of rain were recorded and a successful crop season was experienced. Heavy yields of legume hay were obtained.

Although frost was recorded on 78 days much of it was very light and on the whole the winter was a very mild one.

General. A large number of farmers' meetings and I.C.A. Field Days were attended during the year and various talks given by different members of the Staff. Over 200 visitors including a number from overseas visited the Station.

The Station's Friesland Bull, Bootsma, won the Thousand Guinea Trophy on the Bulawayo Show.

ANIMAL HUSBANDRY

Capital Improvements. During the period under review so much progress was made with regard to the necessary capital improvements for conducting the new beef breeding experiments that it will be possible to commence with these studies in November.

At Lucydale and Lonsdale, expenditure was mainly limited to the erection of paddocks and water supplies and on the main Station a new dairy was built to accommodate sixty milk cows.

Cattle Breeding Experiments. The large scale cattle breeding experiments which have been in operation on this Station since 1938 will be terminated at the end of the ensuing calving season in March.

From the results obtained it is evident that unless nutritional conditions in winter are improved very considerably there is no advantage in grading the indigenous stock to any of the recognized European beef breeds.

New experiments have therefore been planned to determine: (a) to what extent nutritional conditions in this area can be raised by producing sufficient quantities of winter feed for a relatively large beef herd; and (b) to what extent beef production in this area can be increased by selecting for greater efficiency of production under existing conditions of free range.

For the purpose of this experiment two beef herds will be kept and breeding stock will be selected on the performance of their progeny under these two systems of management.

Nutrition Studies. The investigation on the effect of winter feeding on the calving rates of beef cows was continued.

During the first calving season the fed cows did not show a higher calving percentage than comparable groups of cows kept on free range only. This may have been expected as feeding commenced after the bulls had been removed from the breeding herds.

This year, however, after two seasons of feeding, 93 per cent. of the cows which were fed in winter calved down as compared with a calving rate of 73 per cent. in the herds which were kept on free range. Each year so far the calves of the fed cows were 25 to 30 per cent. heavier at weaning than calves reared on veld grazing only. This experiment is being continued to determine whether it is possible to maintain the present high calving rate by feeding breeding stock in winter.

Sheep Production. The studies to develop a smooth-coated mutton sheep by selecting for smooth coatedness within Blackhead Persian x Dorset Horn crosses were continued.

Since coat cover is not affected by nutrition the animals used for this breeding work are being subjected to various planes of nutrition to determine whether trace element deficiencies occur in this area.

General. As in the past this Station was visited by a large number of farmers and research workers from South Africa and overseas.

Also the staff was asked to address farmers meetings as far afield as Fort Victoria and their services were freely called upon to assist farmers with various problems.

PASTURE RESEARCH

Development

Building and General Construction. In the Two Tree Kop Compound another eight roomed block has been completed and two more have reached slab level. An ablution block and lavatories have also been built.

The first stage of the new workshop has been finished and the remainder of the building will be completed after the rainy season.

Cattle weigh-bridges, collecting kraals, bales and races have been erected at the Nursery and on Lonsdale.

Some of the beds in the irrigated nursery have been halved and a new irrigation furrow and stilling pond has been completed.

Fencing. Very little new fencing was erected during the year but a great deal of fence maintenance was carried out. Tubular steel gates have been put in all the ecological experiments in place of the old concertina gates.

Experimental. Experiment 62, to test the effect of di-methly-urea on thornbush was laid out on Lonsdale Extension. Experiment 57, fertilizer trial on Sandveld, was laid out and fenced on Lonsdale, after being abandoned on the original site. A further 10 acres of Bambatsi were established below the stables and small areas were planted to winter pastures in the irrigated nursery.

General. All roads and road verges at Two Tree Kop were cleared of rocks and stumps and a considerable amount of labour was devoted to general maintenance of the Matopos/Westacre Road and of Station roads.

Research

Veld Management Experiments. These experiments continue to yield good results. The 1955 dry season was exceptionally good and green pickings were available in most paddocks during most of the winter. As a result, the experimental cattle started the 1955-56 rainy season in excellent condition. Weight gains were good throughout the growing season but in the present dry season losses have been severe and it may yet be necessary to give some of the steers in the more heavily stocked treatments supplementary feed before the advent of the rains.

At the last meeting of the Research Committee it was decided to make some changes in the veld management programme. These changes are to take place as soon as possible and will be as follows:—

(1) Experiment 1 (2 paddock, 1 herd) and Experiment 3 (4 paddock, 1 herd) with burning both on thornveld, to be replaced by a statistical experiment testing the 4 paddock, 3 herd system at different stocking rates.

(2) Exeperiment 7 (2 paddock, 1 herd) on sandveld, to be replaced by a statistical experiment testing the 2 paddock, 1 herd system at different stocking rates.

The veld management experiments are demonstrating the need for rotational grazing but is is now obvious that the rotation need not be as fast as was originally considered necessary. Cattle, in fact, do better if given a year's grazing in a single paddock, probably because they are able to graze more selectively.

The requirements of the veld are satisfied if it is correctly stocked, if it receives a certain amount of summer rest and if bush is satisfactorily controlled. These requirements appear to be adequately fulfilled on many of the Matabeleland veld types by the use of a system such as the four paddock, three herd system with burning. This amounts to grazing a paddock with a reasonable concentration of stock for three years continuously and then resting it for 12 months and burning it.

The question of making veld hay was further investigated during the year. In the past, animals fed hay in pens did no better than grazing animals during the dry season. During 1955 the animals in Experiment 5 were fed hay in the paddocks with such good results that the trial has been repeated. This year, though, results have been disappointing. Although weight losses have been heavy they have not been as great as those of animals fed hay in pens or of grazing animals not receiving hay.

The following table gives the weight changes of the various groups during the twelve months under review. All steers were approximately 45 months old by the end of September, 1956.

POUNDS WEIGHT GAINED FOR THE PERIOD 28.9.55 TO 26.9.56

Expt. No.	Design	Locality	Stocking Rate	Pounds gained per Head	Pounds gained per Acre
1	2 camp: 1 herd	Thornveld	1:10	88·3	8·83
3	4 camp: 1 herd: burning	Thornveld	1:13·33	132·2	9·92
5	4 camp: 1 herd: mowing	Thornveld	1:10	199·3	19·93
	Ditto with uresa in winter	Thornveld	1:10	243·3	24·33
7	2 camp: 1 herd	Sandveld	1:15	195·0	13·00
8	3 camp: 1 herd: burning: growing season only	Sandveld	1:15	292·6	19·51
9	4 camp: 1 herd: burning	Sandveld	1:18·66	176·7	9·47
29/1	4 camp: 1 herd: mowing	Thornveld	1:6	157·0	26·17
29/2	4 camp: 1 herd: mowing	Thornveld	1:8	142·0	17·75
29/3	4 camp: 1 herd: mowing	Thornveld	1:12	164·3	13·69
29/4	4 camp: 1 herd: mowing	Thornveld	1:10	154·0	15·40
29/5	Continuous grazing	Thornveld	1:8	162·0	20·25
30/1	4 camp: 1 herd: burning	Thornveld	1:8	104·0	13·00
30/2	4 camp: 1 herd: burning	Thornveld	1:10·66	114·0	10·69
30/3	4 camp: 1 herd: burning	Thornveld	1:13·33	121·0	9·08
30/4	4 camp: 1 herd: burning	Thornveld	1:18	173·0	9·61
30/5	Continuous grazing	Thornveld	1:10	209·0	20·90
37/1	4 camp: 3 herd: burning	Sandveld	1:8	172·7	21·59
37/2	4 camp: 3 herd: burning	Sandveld	1:13·33	127·4	9·56
37/3	4 camp: 3 herd: burning	Sandveld	1:18·66	173·6	9·30
37/4	4 camp: 3 herd: burning	Sandveld	1:24	180·3	7·51

NOTES

(1) Experiment 8 is a summer grazing trial and the gains shown reflect the period 9.11.55 to 6.6.56.
(2) Figures shown under Experiments 29 and 30 are the average of two groups of 2 animals each at each stocking rate.
(3) Figures shown under Experiment 37 are the average of two groups of 3 animals each at each stocking rate.
(4) In Experiments 1 to 9 the herd sizes vary from 8 to 12 animals in different experiments.

Veld Burning Experiments. These experiments have continued according to plan and have further confirmed conclusions drawn in previous years. Of these the principal are:—

(a) In order to control bush, veld should be burnt, after a season's rest once in about 4 years. Burning should take place immediately before the rains set in.

(b) Burning more frequently, particularly annually does not provide a hot enough fire to control bush and causes deterioration of the grass cover.

(c) Burning in Autumn leads to a deterioration of the grass cover, with resultant erosion, and does no harm to the bush.

Plant Succession Experiment (Isolation Transects). These experiments show the danger of continued heavy summer grazing. On the heavy soils, particularly, such treatment eliminates perennial grasses and encourages the growth of bush. Recovery after such damage is very slow.

Plant Succession Experiments (Season Grazing). Even moderate grazing *every* summer is shown to cause serious deterioration of natural veld, particularly on heavy soils. There are also indications that the higher successional grasses are being damaged more by grazing in the first half of the season than in the second.

Bush Control Trials. Goats have been proved to be of value in eliminating bush where the bush is accessible to them. Results with 245T and Di-methyl-urea have been disappointing.

Veld Fertilizer Trials. In trials testing the effect of ammonium sulphate on veld the following results were obtained during the year:—

On *black soil* yields of dry matter increased from 0.41 tons per acre (control) to 0.92 tons per acre with 300 lb. ammonium sulphate per acre. Higher dressings of up to 1,200 lb. per acre gave no further increase.

On *red soil* applications of ammonium sulphate in amounts varying from 0 to 1,200 lb. per acre gave no significant increase in yields of dry material.

On *sandveld* 300 lb. sulphate of ammonia per acre raised yields from 0.56 tons per acre to 1.23 tons per acre. Heavier dressings increased yields to as much as 2.42 tons per acre.

Water Relations. In the four years that the run-off plots have been functioning there has been far more run-off and soil loss from the bare plots. In 1953-54 plots burned annually in autumn lost more water than those completely protected, mown annually, or burnt at the end of the dry season once in four years. No other treatments have been significant.

On the lysimeters, treatments were imposed for the first time during the year and no reliable results are available as yet.

Supplementary Feeding. The following are the weight changes in the urea feeding experiments during the periods 25/5/55 to 27/10/55 and 6/6/56 to 26/9/56.

Treatment	Weight change in lbs. per Head	
	25/5/55 to 27/10/55	6/6/56 to 26/9/56
1. Urea, molasses and cobmeal	+ 33·4	— 29·0
2. Veld spray	— 8·3	— 126·6
3. Urea/molasses lick	—	— 18·0
4. Hay plus urea and molasses	+ 76·6	— 0·8
5. No supplement	— 20·9	— 129·0
6. Hay alone	+ 34·6	— 88·2

NOTES

(1) All animals graze day and night and the above supplements are given in the paddocks.
(2) Groups 1, 2 and 5 graze identical paddocks on sandveld. Groups 4 and 6 are in similar paddocks on thornveld but can not be compared with other groups. Group 3 is a group on its own on sandveld.
(3) In 1955 feeding of groups 1, 2 and 5 started on 21/6/55. Group 3 only entered the trial on 21/6/56.

Planted Pastures. The first phase of the planted pasture work is now drawing to a close and work on the second phase is to be intensified. The first phase included nursery and introduction work, variety, fertilizer and spacing trials, etc. In the second phase the utilization and management of large scale pastures are to be investigated.

The initial work has shown that for dryland conditions the following grasses are worth considering:—

Panicum coloratum (Makarikari st. 14/12)
Panicum coloratum (Zhilo strain)
Panicum coloratum (Bambatsi strain)
Cenchrus ciliaris (Zeerust strain)
Chloris gayana (Katambora strain)

The programme of investigation on Napier Fodder, which includes spacing, grazing, cutting and fertilizer trials seems to indicate that there is little or no place for dryland Napier Fodder in Matabeleland.

As far as irrigated pastures are concerned most promise to date is shown by a mixture of Kentucky 31 Fescue, Chilean Red Clover and New Zealand Wild White Clover, Ronpha, however, which is still being bulked up, merits serious study as it appears to be an exceptionally fine grass.

Up until the beginning of the 1955-56 season the irrigated pastures were grazed by dairy animals. During the present season grazing was discontinued owing to the unsuitability of the cow groups. Because of this it was not possible to assess accurately what was, in fact, being obtained from the pastures.

Co-operative Trials. The grazing trials in the Prospect Native Area and the Nata Reserve have been discontinued owing to the fact that similar work is being carried out at Tuli and because of difficulties in connection with supervision. The trials were run co-operatively with the Department of Native Agriculture.

A grazing trial on Devuli Ranch, Sabi I.C.A., has been started in collaboration with the Department of Conservation and Extension. Grazing started in May, 1956, and fixed point photographs were taken and botanical notes made at this time. The results will tie in well with the work at Tuli.

General

A large amount of advisory work was carried out during the year and many visitors, from both inside and outside the Federation, were conducted round the experiments.

Work in connection with Native area assessments drew very greatly on the time of professional officers and work on the Station suffered as a result.

The labour position has not been satisfactory during the year owing to the insufficiency of funds. Furthermore the gang of convicts which has been available for the past two years has now been withdrawn.

The position regarding professional staff is critical owing to transfers. At present there are two vacancies.

NYAMANDHLOVU PASTURE SUBSTATION

Climate. No appreciable rains fell until December, 1955, and a January drought followed. Good rains fell after the drought and continued until the end of April. The total rainfall for the rainy season was 22.97 in. plus some unseasonable rains in August and September, 1956. The seasonal rainfall was nearer the average for the area and therefore more useful than previous seasons from the experimental point of view.

Development. A building incorporating storerooms and a workshop, and quarters for the African Assistant were completed during the year. The old office was pulled down and the new one is in the course of construction. No changes or additions were made to the experiments. Twenty acres of red sandy loam were opened up for crop trials and experiments.

Research

Kalahari Sands (*Summer grazing*). In the experiment in which no burning has been employed in the grazing system, and the bush is dense, the cattle weight gains for the summer grazing period were about 30% less than in the other three experiments which have burns included in their management. Considering that the season was one of average rainfall this may be significant, the weight gains in the four Kalahari sand experiments have not shown any appreciable differences in previous years.

Many of the trees which were "killed" by burns are coppicing but future burns will no doubt kill off the young coppice growth.

Basaltic Clay (*Winter grazing*). The yield of hay during the season was 1.8 tons per acre.

In the browse versus cleared veld experiment there has been so much excess grass in the cleared paddocks that two extra steers were added to the herds of three steers in each of the three paddocks in July. This does not appear to have had any adverse effect on the weights of steers up to the present date. By cutting and weighing grass in the cleared and uncleared paddocks it was found that the cleared carried just on 60% more grass by weight than the uncleared in the 1955-56 season.

It would appear on this winter's evidence only that the cleared black clay veld is capable of carrying 66% more cattle than the uncleared. Stocking at 1:4 acres on the cleared veld seems to be a little too high because although there is still plenty of grass, the steer weights took a sudden steep downward trend at the beginning of September while the 1: 10 group weights have only fluctuated 30 lb. up or down since May and are at present (October) the same as they were in May when they were put into the paddock. This confirms the findings of the 1955 and 1954 winters.

Red Sandy Loam (*year-round grazing*). In the stocking rate trial the 1: 13 group has done the best while the 1:40 and 1:8 groups have lost about the same weight this winter.

The 1 herd 4 paddock steers have lost less weight so far this winter than the 3 herd 4 paddock steers. If this is still the case when the rains come it may mean that the more rests which the veld gets in the first system are at last having an effect.

The winter hay versus grazing experiment has confirmed previous findings and has now served its purpose.

Ecological Experiments (*red sand soil*). In the first year of fertilizer applications on veld the 400 lb. sulphate of ammonia and 200 lb. super dressing gave 5 times the green weight yield as the control plots. This will be continued during the approaching growing season.

The seasonal grazing plots indicate that the winter grazed plots are in the best condition while the plots grazed for the whole of the growing season are worst.

Even in the summer rested plots bush is however encroaching indicating the necessity for control.

In the Isolation Transect plots, results are interesting. Recovery has been very slow and patchy. It is noted that in a plot which has had 7 years' complete protection the *Heteropogon* and *Themeda* stools have died off within the last two years and there are still mainly annuals in the next plot which has had 6 years' protection.

Couch Observations (fallow red arable reverted to couch). The cattle on couch at 1:6 have lost weight rather heavily this dry season perhaps indicating that the grazing pressure is rather high for the winter after an average rainy season.

Dryland Artificial Pastures on Red Soil. These were used for summer grazing (4 months) only and at the rate of 1 beast to 1½ acres gave good weight gains with Creeping Makarikari and Gold Coast Napier taking the lead. No fertilizer was applied during the 1955-56 season although in the previous season 150 lb. each of sulphate of ammonia and supers per acre was applied. The Makarikari gave 145 lb. of beef per acre during the 4 months from mid-December to early April.

Arable Trials. In spite of late rains and the January drought all crops did fairly well.

Both the Potchefstroom Pearl and Sahara maize yielded 13 bags to the acre on the Kalahari sands, while the Sahara gave the best silage yield at just under 9 tons per acre. Velvet beans yielded just over a ton of hay per acre. These crops, except the beans, received 150 lb. each of sulphate of ammonia and supers per acre. The sorghums did not do well because of poor stands; some plots had to be replanted.

Of the grain crops on the black clay soil Sahara maize did the best at 16.3 bags per acre. The best silage crop was Haakdoorn sorghum at 19.4 tons per acre. Beans yielded just under 1½ tons of hay per acre. The black clay crops received no fertilizer. During the 1956-57 season critical crop trials will be laid out on the Kalahari sand and black clay soils to determine the best fertilizer applications and espacements for maize and sorghums. The new red land will be planted to various legume crops because it has not been previously cropped.

Umkouzaan. Various hormone weed killers and C.M.U. are being tried on umkouzaan (a highly poisonous veld plant on Kalahari sands) this season in co-operation with Pest Control.

TULI PASTURE SUBSTATION

Development. The development of the Station continued satisfactorily during the year.

In accordance with the planned alterations to the method of stocking the experiments, some of the existing fences had to be moved during the year to allow for the adjusted stocking rates.

The new access road to the experimental block has been completed and a new road firebreak around the new reserve area has been cleared, stumped and graded.

The new water reticulation scheme has been in operation for nearly a year now and has proved very satisfactory. Two new watering points have been provided.

Research. Veld management experiments have now been in progress for 3¼ years and until 17th November, 1955, cattle groups consisted of animals of the same age group. It was decided, however, to run animals of three different age groups in the experiments and on that date weaner steers about 10 months old were introduced. This gave herds containing animals of 10 months and 22 months old. During October, 1956, some of the older animals will be replaced with weaners and from then on experiments will be stocked as planned.

There are five major experiments designed to supply information regarding stocking rates, systems of management, effect of fire, and the relative merits of grass and browse plants.

During the present dry season all animals have lost weight steadily since June. This is unusual as in past years weights have increased slightly, or been maintained, until November when a sharp weight drop occurred. The weight lost was then regained within a fortnight. Possibly the reason for this year's results is the fact that the rains stopped very early and the veld was dry very much earlier than usual. Added to this there is an abundance of grass and the cattle are showing very little inclination to browse.

During the year there has been very little difference between the weight gained by any of the groups, even the steers at 1 to 10 acres having put on nearly as much weight as those at 1 to 30 acres. This is ascribed to the fact that the groups will not be up to strength as regards age for another month and to the great abundance of grass.

The burning experiment site has been abandoned and it will be re-surveyed on a larger scale and on a more suitable site as soon as staff replacements are obtained.

Disappointing results have been obtained from the use of 245T as a method of bush eradication.

General

Veld Fires. Two unscheduled grass fires invaded the Pasture Block during the year. The first, early in May before the firebreaks had been properly cleared, burnt out about 2 acres of Experiment 1 D. The second, much more serious, took place on September 4th and burnt out the whole of Experiment 3 and three-quarters of Experiment 8. Both fires started in adjacent Native Areas.

A still more serious accident took place on 21st October, 1955, while a paddock was being burnt according to programme. Two natives were trapped by the fire and one was burnt to death. The other recovered from his serious burns after some months in hospital.

Rainfall. A total of 16.83 inches was recorded during the year. This is slightly above normal.

Visitors. Notable amongst the visitors to the Station were the Minister of Native Affairs, the Officer in Charge, Grasslands Research Station (now Chief Pasture Research Officer) and Professor Davies.

FIELD HUSBANDRY

Development. The most important building and equipment additions and developments have been the seed testing chamber complete with air conditioning unit, six additional experimental silos, a lean-to shed, re-glazing of the glass house, a new T.V.O. tractor, and grain and soil moisture measuring equipment.

Plans for the development of a heavy soil irrigation project are in hand and work done includes drafting equipment requirements, land selection, reservoir building and fencing.

Staff developments include the changing of a Section Manager's post to a Professional Officer's post to allow greater emphasis to be placed on the plant breeding work.

Research. The season's rainfall was very satisfactory as judged by crop yields although the total was lower than normal and there was a 30 day dry spell in January. The outstanding results of field trials were as follows:—

1. Dryland maize variety trials suffered from selective theft and poor stands but an irrigated variety trial gave yields from 16 to 42 bags per acre. Among the higher yielders were a number of Natal inbreds and open pollinated varieties which will be brought into the breeding programme.
2. Sorghum variety trials gave yields from 6.8 to 19.7 bags per acre. This year the later maturing varieties did well. The varieties Radar, Plainsman and Lobengula were among the higher yielders, the last named being a dual purpose type.
3. Fertilizer trials conducted on the heavy soil gave no responses to nitrogen and phosphate in the range 0 to 500 and 0 to 400 lb./acre respectively.

   When used on different crops on the sandveld, however, highly significant responses were obtained from nitrogen, phosphorous and their interaction. With the combination of high rates of nitrogen and phosphorous maize grain yields went up to 22 bags per acre, maize silage yields up to 17½ tons per acre and millet silage yields up to 11¾ tons per acre.
4. In hay crop variety trials on heavy soil no significant differences were obtained between 11 velvet bean varieties where yields of hay in tons per acre ranged from 3.06 to 3.57, nor between 7 cowpea varieties with yields from 1.7 to 3.42 tons per acre. In a manurial trial on the sandveld velvet beans gave an average yield of 3.35 tons per acre and gave significant increases in yield due to high rates of organic matter application, phosphate and nitrogen application.
5. Castor beans gave low yields on the sandveld, about 600 lb. per acre, but on the heavy clay soil yields were higher. A ton of undecorticated seed per acre was obtained at closer spacings.
6. A potato variety trial on heavy soil well manured and with supplementary irrigation gave yields ranging from 28 to 135 bags (150 lb.) per acre. Interesting observations on susceptibility to late blight were also recorded.
7. A stubble mulch trial and a three course rotation trial were started while a long term rotation trial was completed. The results of this rotation trial were inconclusive; there appeared to be little difference between a number of three and four course rotations and continuous maize as judged by the effect of previous cropping on a test maize crop. Continuous cropping with sorghum, Bambatsi, Napier and fallowing depressed the yield of the test maize.

The plant breeding programme consisted mainly of testing, and observing and assessing the value of existing breeding material about which there is little recorded information. Approximately 230 sorghums, 300 maize and over 100 millets were grown from which selections were made or which were retained completely to give adequate material for future use. Mass selection was carried out on eight commercial varieties of maize and the numbering and recording of plant breeding stocks were reorganized.

General. In future work greater emphasis is to be placed on fodder crops, field experiments on sandveld and on climate/soil/moisture studies since these appear to be main factors affecting crop production in the lower rainfall areas.

With the proposed expansion of work on irrigation, both heavy soil and sandveld projects, and the proposals to build up crop investigational work at the Nyamandhlovu Station, additional staff will be required.

During the year the Section's staff toured extensively in Matabeleland under the auspices of the Departments of Conservation and Extension and Native Affairs.

A number of Farmers' Days and Meetings were attended at some of which talks were given. Conferences were attended in Salisbury, Gwelo and Bulawayo and judging was undertaken at Agricultural Shows held in Bindura, Fort Victoria, Bulawayo and the Shashani Native Reserve.

POULTRY

Development. An Assistant Poultry Officer was appointed as from 1st October, 1955. Through this appointment much more work has been done on the poultry plant and more time has been available to spend on extension, advisory and experimental work.

Buildings. A new brooder house, with a capacity of 1,800 chicks up to six weeks of age, incubator and egg room have been completed, except for the ceiling. A block of two breeding pens was completed.

Stock. To date the number of all birds on the Station is 1,200. During the year a start was made with the breeding of New Hampshires and Light Sussex birds. These two breeds will be multiplied and improved for the production of table birds. The original stock were obtained from local chick producers.

Research

Experiment (1): Chick Mash compared with Improved Chick Mash. The object of this experiment was to find out whether the anticipated extra growth warrants the extra feed cost. The results were that the growth expected was obtained and also that the extra pounds of poultry meat obtained more than pay for the extra food consumed at a higher price than the ordinary chick mash.

Chick Mash (A)		*Improved Mash (B)*	
Number of Birds	Weight at 9 weeks	Number of Birds	Weight at 9 weeks
20	34 lbs. 13 ozs.	20	55 lbs. 12 ozs.

Food consumed to 9 weeks. Group A 125 lb. 8½ oz.
Group B 139 lb. 3¾ oz.

Weight difference 20 lb. 15 oz. in favour of Group B.

Difference in food consumed, Group B consumed 14 lb. 11¼ oz. more food than Group A.

Price difference in food, 1d. per lb.

Experiment (2): Antibiotic (Penicillin) compared with ordinary Chick Mash. The number of birds in each group was 30 and the results were as follows:—

Mortality: 1 Penicillin Group.
4 Control.

Deformities: Black Australorp in Penicillin Group showed deformed legs. None of these deformities was noticed in the Control Group.

Weight difference: 15 lb. in favour of Penicillin Group.

Food consumption: Penicillin Group consumed 7 lb. more food during the 12 weeks than the Control Group.

Experiments not Concluded

(1) Maize, milk and greenfood feeding on range in comparison with mash and green feeding.
(2) Chemical caponizing at various ages from day old.
(3) Maize and mash from day old compared with mash only under intensive conditions.
(4) Three differently constituted broiler mashes plus pellet feeding from six weeks of age.

General

Extension Work. During the year 130 farms were visited, amounting to 125 days away from the Station. 139 farmers visited the Section. A total of 47 meetings were attended.

Shows. The Poultry Officer judged at the Lusaka Show, and the Young Farmers' exhibit at the Bulawayo Show. An exhibit of table birds was staged at the Bulawayo Show. This resulted in an increase in interest in table bird production and a greater number of visitors to the Section.

Marketing. Due to the efforts of two commercial firms, a big improvement is noticed in organized marketing of eggs and table birds. The one firm started to buy all surplus eggs at 2/3d. per 24 oz. dozen as from August this year. All farmers are very satisfied and are trying to get this firm to accept eggs all the year round.

The other firm is dealing in table birds only and hopes to build a modern killing plant in due course if the supply warrants it. The prices paid are 2/- lb. live weight for broilers and 1/9d. lb. live weight cull birds and 2/11d. each for poussons.

Farmers' Days. Two very successful farmers' days were held at Matopos Research Station and at a commercial poultry farm near Bulawayo respectively. The attendance was good.

THE SABI VALLEY EXPERIMENT STATION

DR. C. D. CONVERSE
Officer-in-Charge

General

Measured by crop production, this has been a poor and disappointing year at the Sabi Station; but in research, progress has been satisfactory except with wheat, even in the face of generally low yields. Progress in other phases of the Station's development has been encouraging.

The miserable production levels were probably mainly due to two conditions: One, a stretch of extraordinarily wet weather in December when more than one-third of the total rainfall for the season was precipitated in less than a week, resulting in serious setbacks to maize and cotton crops; and two, another season of very heavy rust infestations on wheat. The weather is something that one accepts; even with surface drainage, precipitation like that of last December can only result on Sabi soils in serious symptoms of degraded soil structure, reduced aeration in the root zone, increased leaching of nutrients, and marked interference with plant growth.

But the nearly total futility of all the effort put into wheat research was tragically disheartening, when one knows that the answer is so simply a change in genetic material. All the research work on the cultural and nutritive requirements for wheat was a total loss at the Station this year, and will continue to be, badly as it is needed, until varieties resistant to, or immune to, the local races of rust are available in quantity for experimental plantings. Losses this year seemed so much worse because the crop looked so good before the rust struck; large-scale yields of up to 20 bags an acre were expected on the basis of the crop appearance; mean yields from all experiments except the variety studies amounted to less than 4 bags per acre.

And it is not as though the Valley could not grow good wheat. In the two variety experiments some excellent yields were scored. In one, where plantings were made very early, which is one way to partially reduce the effect of the disease, and where the plots were in the area of the Station lands least affected by rust, three apparently well adapted local strains all scored mean yields of above 25 bags per acre. In the other, of a collection of 64 varieties that were subject to the heavier mid-planting-time rust attack, the mean yield from twelve highest yielding strains amounted to 17.60 bags per acre. It is significant that every one of these top twelve wheats showed none or very little rust, and came from Portuguese sources. They appear to be far ahead of the Rhodesias in their wheat breeding programme. It is worth a further note that of the 64 varieties mentioned above, the poorest six averaged only 1.30 bags of grain per acre.

The opinion that the Sabi Valley can produce good grain is further substantiated by rice and barley results. In a rice variety experiment, the mean yield for the whole trial came to 17.3 bags per acre. In the fertility experiment the mean yield amounted to 15.4 bags per acre. A barley variety trial gave an average of 19.6 bags of grain per acre, with a high of 29.2 and a low of 10.3.

Weather in the Valley was normal during the past year, with the exception of the unusual rains in December, and that is the sort of thing that any farmer expects once in a while. Although the early summer maximum temperatures were higher than during the year previous, winter temperatures were also higher, and there was no frost during the year just completed. Rainfall was nearly the same as in the previous year, 22.73 inches during the current season as compared to 22.36 from the past. The distribution however, was much more erratic.

The building programme, as compared with progress on the crop production front, is a joy to contemplate. Both houses at the farm site were completed at a very economic figure; the drying barn is complete except for the electrical work which has been held up by an inexplicable delay on the part of the contractor in getting a small switchboard part from the U.K., the cattle kraals are nearly complete, as is the spray race, and only the weighbridge remains to be installed; the hay storage barn is complete and has been for some time, and the new dairy building is almost finished. There is no water supply to the buildings at the farm site as yet.

Construction has started on the new water supply for the Station housing and laboratory section; although water will have to be rationed through this dry season as in the past, supplies should be ample next year. The draft on the irrigation pumping plant on account of the Pilot Farm has been greater than anticipated and although there has been no serious shortage of water for irrigation, considerable unrest is felt on account of lack of standby facilities. If the present plant breaks down, losses to both the pilot farm and the Experiment Station would be catastrophic. An increase in the pumping capacity of the irrigation plant to allow for additional draft and standby security is promised; construction was to have been finished this year. It appears now that it may be commenced by the end of the year.

The provision of a staff mechanic at the Sabi Station has resulted in substantial savings of time, money and operating costs.

The Soil Physicist who came on to the Station staff during the year was assigned mainly soils physics problems, since they are the most urgent of the technical studies needed, and after doing some very significant preliminary work in the field and setting up a constructive routine programme of investigations for his assistant to follow, has been sent to the United States to do a year's post-graduate work in soils physics at the University of Utah, where there is an outstanding school of Irrigation Soils Research. He will be away during the whole of the coming year; meantime a substantial body of data will be accumulated against his return, which will enable him to get quickly into some of the major problems having to do with the irrigation of the Sabi soils.

As indicated above, the lack of a plant breeder over the past two seasons has hampered progress at the Station seriously. More and more money is being wasted in fruitless agronomic work, for lack of proper genetic material to exploit the manifold advantages of climate, soil, and irrigation that the Sabi offers.

Field Crop Investigations

Maize. Maize yields this past season were disappointing, although results from the work done were satisfactory from the research standpoint. Nearly all the experiments laid down produced statistically valid data, but the over-all figure for yields was only 11.14 bags per acre. Since most of the maize was in mid-growth in December, it was just at the stage to be most damaged by water-logging consequent upon the period of heavy, concentrated rains that occurred between the 9th and 15th December. A number of mean yields did exceed 19 bags to the acre, but none of the Salisbury white hybrid crop did better than that. Indications are that the Sabi yellow hybrids produced up to 30 bags per acre in some cases, but it is too early and the plots were too small to put a great deal of reliance on those figures. The only significant response to fertilizers continues to be from nitrogen; there was an idication that band placement may be better than broadcast for the second application, but the data are not conclusive.

It is increasingly obvious that sizeable applications of nitrogen early in the life of the maize crop produce nothing like the results of heavier late applications. It was shown that where maize followed cotton or sorghum, other things being equal, the yields from the ex-cotton plots were highly significantly reduced. When maize was interplanted with sunnhemp at seeding time and at the waist-high stage, the seeding-time interplantation very significantly reduced maize yields; rust damage to subsequent wheat prevented any estimate of the importance of these interplants for wheat production. Double rows of maize at 18 inches wide separated by a 5-foot space, produced no more grain than standard rows in a 42-inch spacing. Green manure in the rotation as compared with a soil depleting crop produced highly significant yields favouring the continued use of green manures; an interesting observation was that infiltration is now much more rapid into the plots where green manure has been regularly used, than into the plots that have been kept in continuous cultivation. The maize results from the "metered water" experiment were not especially enlightening, due probably to the heavy rains in December and the lack of any real control of the moisture stress in the "dry" plots. In general the yields from the "dry" plots were greater than from the "wet" ones, but under the high nitrogen regime yields from the "wet" plots were higher. Spray trials for rust control produced little in the way of information. Genetic control is much more promising.

Cotton. For the first time, the year's cotton yields were really unsatisfactory at the Sabi Station, probably for the same reason that maize yields were low; that is, the setback due to heavy precipitation in December. The toxic breakdown of one of the trial insecticides further reduced yields in some cases. In a date-of-planting and insecticide trial, best yields were obtained from the earliest (October 15) planting; where the crop was not protected losses amounted to 64% of the possible production as measured by that from the protected plots. In another trial of insecticides it was shown that the new material "aldrin" was superior to the standard BHC-DDT mixture previously recommended.

It is too soon to recommend this material for general use however. In the same trial, 48% of the possible crop was lost when no insecticide was used, and it is pointed out that there must have been some protection to the non-treated plots by the mere presence of the poisoned ones, without taking into account the possibility of the drift of insecticidal dust. Most of the results of variety trials will be reported from Gatooma, but as in the previous year, the highest mean yield came from one of the newer strains. It amounted to 2,202 pounds of seed cotton per acre as compared with more than twice as much for the previous season's high, but as stated, everyone must expect a bad year some time. The over-all mean for the whole Station came to 1,234 pounds per acre. On the basis of work done on the farm-scale plots, it was calculated that it took about 600 pounds of cotton to pay for the growing of the crop, including the cost of water and interest on the land figured at £100 an acre. This would make the Station crop worth about £22 an acre, net. It appears that nitrogen requirements for cotton are about the same as for maize, as far as application times are concerned; that is, a little to start the plants off, but the bulk of the ferilizer applied just prior to the rapid growth of the fruiting bodies. In a moisture experiment, the "medium" plots outyielded the "dry" ones, which in turn produced more cotton than the "wet" plots.

Wheat. Of the nearly 20 acres of wheat that were planted at the Sabi Station during the current year, less than half an acre produced results commensurate with the cost of the work. The only experiments of any value were the variety trials; one showed that out of a collection of 64 strains, yields ranged from a high average 20.03 bags per acre down to a low of 0.16. The mean of the best 12 came to 17.60 bags per acre; every one of these was from Portuguese sources.

The other varitey trial included three planting dates; because the earliest planted material is least affected by rust and because of the location of the plots in the area of the Station least affected by disease this season, some remarkable yields were secured from locally adapted strains, the average from the top 3 being above 25 bags per acre. Unfortunately, these data are marred by the necessity of some estimates of probable production from a few plots, required by losses due to birds. But the estimates were conservative, and were based on results from unaffected replicates in the trial. Bird damage was not serious this year, except on a few of the earliest plots. Some loss seems inevitable, but the pests were not present in the over-powering hordes that have been seen in some years of the past. There was no attempt made to estimate possible yields had rust not struck; it is felt that a basis for such estimates is lacking, and that any figures produced would not be reliable.

One pronounced aspect of the rust was its curious distribution on the Mopani Farm, where the plots all run in series in east-west direction. Without exception, wheat yields were relatively high on the east side of the farm, and progressed to very low on the west end of the lands. It is not a soil response, since no other crops are so affected. The only readily occurring explanation is that the dew dries off the east end of the farm much more rapidly than from the west, but this would need careful substantiation by a physicist. The plot lay-out on the Acacia Farm is different, and this effect was not noticed on that part of the Station. It was noted, however, that as far as general appearances went, until the rust did attack, the wheat appeared to be much more promising on the Mopani soils than on the Acacia lands.

Barley. The barley results were nearly as attractive as the wheat experiments were disappointing. There was one major experiment, a yield trial with 15 varieties, the mean yield from which was 19.6 bags of grain per acre, with a top mean yield from California Atlas of 29.16 bags per acre. Three of the strains produced mean yields of over 25 bags to the acre, and the top eight all yielded more than 20 bags to the acre.

Rice. In the variety trials, 4 of the 6 strains produced between 19 and 20 bags of grain per acre from a new planting; the mean for six came to 17.3. In the fertility experiment, the mean yield from all plots amounted to 15.4 bags per acre. Rice does not appear however, to offer scope for further productive work at the Station until such time as water for large-scale use in the Valley is promised.

Alfalfa. From data covering alfalfa hay harvests over the past four years, it is shown that 8 to 10 cuttings per year are likely, and that the mean return per cutting will be about 1.1 tons of hay per acre. Heaviest yields have been during the months September to February inclusive; leafiest and best appearing hay is made during the months March to September inclusive. Greatest losses from rainy weather are apt to occur during November to March, inclusive. There appears to be little differences between returns from alfalfa from 6 to 18 months old, and from 18 to 30 months old. Older alfalfa produces more during the early part of its growth than the younger stands, but falls off very much more rapidly in production as it goes into its third year stage than the younger stands do as they move into their second year production cycle. Results from neighbouring irrigation farms as well as from the Station lands indicate that it is safe to figure on an annual return of about 9 tons of hay equivalent per acre per year; this value may be improved as new strains are proved. This does not take into account probable summer hay losses due to rains. Nothing has as yet been done in the field of breeding or selection for a strain specifically for the Sabi irrigation area, and rust still continues to attack all present strains to a greater or less degree.

After several years' observations covering some 20 strains of alfalfa, the five best, Hairy Peruvian, Morocco, India, Caliverde, and Hunter's River, have been put out in a large-scale variety test.

Green Manures. To date, sunnhemp still appears to be the best all-round green manure crop for the irrigated Sabi. It germinates well, grows rapidly, and sets good seed crops during the winter. It is however, proving to be as susceptible to stem-break at the Sabi Station as elsewhere; most intense attacks occur where the crop has been on the lands at least once a year for several years. Other *Crotalarias* tried to date have been slow to germinate and get started, and have not been at all successful in competing with weeds, though one or two have looked good once they did get well grown.

Cowpeas, although they are attacked by aphids and chewing insects more than some of the other legume green manures, appear to be next best to sunnhemp as a general purpose green manure They germinate promptly and grow rapidly and compete well with weeds; they also turn in a good tonnage of green material for ploughing down. The relative percentages of nitrogen from the various green manure crops now being used, or under trial, at the Sabi Station have yet to be determined.

Other green manures that have some promise, but are more limited in general use on account of seasonal specificity are: velvet beans, dolichos beans, mung beans, *sesbania*, dahl and possibly hairy vetch and field lupins. Tests with the above varieties and introductions of new materials will continue indefinitely.

No statistically significant difference on following crops of maize and wheat has been shown to result from the use of several different species of green manure legumes.

Sugar Cane. This crop continues to turn in a good record at the Station. Sugar percentages in some lines have been very high, with high readings for purity of juice. Mean yields of the better strains have been from 47 to 56 tons of cane per acre, with crude sucrose indeces of 7.8 tons per acre from the two best lines.

Fruit. Bananas continue to do very well indeed, with a mean yield of 55,357 pounds of high-quality fruit per acre reported for the past year from the highest yielding treatment of the three under trial.

The results of the small experimental pineapple plantation are at hand; in just over a year, the cayenne variety produced a mean of 523 individual fruits per acre at an average weight of 2.83 pounds apiece for a total of 1,480 pounds per acre. The quality of the fruit, and the flavour, were both outstanding; in the writer's opinion as good as fruit produced in Hawaii. Under the same conditions, the Queen variety produced 418 fruits at 1.31 pounds apiece, for a total of 547 pounds of fruit per acre. These yield differences were statistically highly significant.

Under different spacing, the Queen variety also produced 460 and 293 fruits per acre at weights of 1.38 and 1.44 pounds apiece for totals of 535 and 422 pounds of fruit per acre. The quality and flavour of the Queen fruit was also excellent.

Citrus continue to do well, but the dates have succumbed in greater or less degree to rust; some of the more resistant palms may set fruit some years, but prospects for dates as a fruit crop are not bright for many reasons.

Papaya is far more apt to be exploitable on a commercial basis; it does well, and could be handled on an annual basis, since the best fruit are borne from the first blooming season.

Technical Research

The entire stock of 60 British-built tensiometers were tested in the laboratory and found to be unsatisfactory for use and difficult or impossible to modify; about a dozen American commercial models have been obtained for use in irrigation and moisture level studies. Gypsum blocks have also been installed in field plots for following subsurface moisture conditions. Infiltration studies of a preliminary nature indicate that there is a close correlation between observed behaviour of soils under cropping, and the rate of infiltration of water into them. It was noted that among plots that had been in alfalfa for nine months, infiltration rates were rapid, and were of the same order as in virgin soil, whereas among plots subject to various farming operations, infiltration rates were retarded, in some cases to a pronounced degree. The suggestion is made that now is the time, when work in this field is just starting in the Rhodesias, for research men to get together with the officials of the Department of Conservation and Extension who may have occasion to work with infiltration rates, and set up standards of procedure and interpretation which would be applicable and common to all technicians in the Government Services.

Some irrigation efficiency measurements were made on the farm-scale plots, and methods were worked out for the accumulation of data during the absence of the Soil Physicist. This is also true of measurements to be made of the efficiency of sprinkler irrigation under various conditions of wind, temperature and humidity during the coming year. Some initial root studies were made with cotton, and it was found that probably close correlations can be expected between some of the standard soil physical constants, and the way the crop grows. Further work in this field will have to await the return of the officer now overseas on study leave.

Those soil physical studies initiated to date, by way of determining possible correlations with agronomic results, and for establishing methods applicable to Sabi conditions, include:

1. Apparent density measurements (an idication of porosity).
2. The stability of aggregates in water. Sor far it has been found that the soils on the Station do not appear to have an aggregate structure that can resist wetting, which gives rise to the severe crusting that is such an acute problem.
3. Modulus of rupture measurements (a crusting index).
4. Soil temperatures (important determinants of root growth and microbiological populations).
5. pH and soil solution conductivity measurements, which may index important physical, structural and chemical conditions.
6. Krillium stabilization studies.

The general supervision of the management, and the detailed measurements and records from the "metered water" plots falls within the scope of technical research; both wheat and maize crops

were taken off these plots during the year. The results are reported elsewhere. A portion of the plots are down to alfalfa, and when they come out of this crop and are put back into rotation, the results of that work will be reported.

Animal Husbandry Research

Pastures. Approximately 25 acres of land have been set aside for irrigated pastures. These range from stands of pure alfalfa, through mixed alfalfa-grass, other mixed legume-grasses of various sorts, to pure grasses. In all, there are 14 legumes under trial and 21 species of grass. Since the local "Sabi grass", one of the *Urochloa* species *(rhodesiensis),* makes such excellent natural pasture, one experimental plot will be watered and left to come up to this grass. Wimmera rye grass, several strains of subterranean clover, irrigation ladino clover, and strawberry clover brought over from Australia have been planted in the nursery; one of the subterranean clovers has already nearly completely died out after getting off to a good start, two are doing moderately well, one is still very flourishing, and one appears to be setting a good seed crop. Both the ladino and palestine strawberry clovers are still flourishing.

Dairy Cattle. The Jerseys continue to do very well indeed. Heifers born and reared at the Station are coming into production; there has been no difficulty with either oestrus, abortions, or calving among them. At present 8 cows and heifers are in milk at the Station.

Beef Husbandry. No feeder cattle are as yet on the Station, but approval has been given for the acquisition of a number of native-type steers to initiate alfalfa grazing studies. Once the pastures block is in production, and grazing procedures have been worked out, it will be possible to handle more animals of better quality in the management trials.

Sheep and Mutton. A small flock of native type ewes from local stock carrying ¼ Wilshire blood, has been established. They are off two Wilshire-Persian rams held at the Station, and the female offspring of each will be mated to the other in a breeding and progeny test. It is hoped to be able to select breeding material from these sheep for establishing foundation stocks for possible use in the Valley. The flock will be used at least in part for grazing experiments on the irrigated pastures.

Buildings. It has been planned to move all the livestock to the farms site, to be nearer feed supplies, to get the fly attraction away from the housing site, and to centralize management. The new milking barn and dairy feed-lot is nearly finished, but its use will be delayed awaiting water supplies. A large dutch barn hay shelter measuring 27 by 60 feet, 14 feet high has been built next to the beef feeding yard, made to accommodate 40 large steers or 50 smaller ones. A handling yard has been built, with a simple crush; the spray-race is nearly finished, but the weighbridge that is to be a part of this installation has not yet been delivered. About 12 acres surrounding these buildings have been fenced; there remains to be constructed a sheep pen and shelter, and a new poultry shelter.

GATOOMA RESEARCH STATION

A. H. McKINSTRY
Officer in Charge

Rainfall. During the 1955-56 season, rainfall created four records: Firstly a total of 47.46 in. was the highest seasonal rainfall recorded at the Gatooma Station over a period of 31 years; secondly 2.39 in. for the whole of January was a record "dry" total for that month; and lastly 17.13 in. and 9.79 in. for February and March respectively were record "wet" totals for these two months.

The first 26 days of January were virtually a drought period, for although six days was the longest period without rain, falls were negligible until on the 27th of the month 1.99 in. fell to break the drought.

A violent storm occurred on the 15th February when 4.78 in. of rain was recorded in less than three hours.

Further details of rainfall and also of sunshine are given in the following table:—

RAINFALL AND SUNSHINE RECORDS

Month	Total Rainfall (inches)	Rainless days	Longest period w/o rain	Average sunshine hours per day
October 1955	0·27	29	13	8·4
November 1955	4·25	18	6	8·2
December 1955	10·41	12	9	6·2
January 1956	2·39	24	7	6·6
February 1956	17·13	8	5	6·2
March 1956	9·79	14	6	6·6
April 1956	3·22	21	10	6·9

Cotton Plant Breeding. Applications of Endrin as a spray to limited areas of the plant breeding material markedly reduced insect pest attack and increased yields. Comparison between strains for inherent yield capabilities were thereby facilitated.

Where DDT/BHC dust was applied yields were patchy and comparisons less satisfactory. This result was probably due mainly to rainfall action in washing off much of the dust.

Arrangements have been made to apply Endrin to all cotton breeding plots in 1956-57. As this will result in jassid being controlled, resistance to the pest will be assessed by leaf hair counts.

Waterlogging of cotton experiments and other plots, an adverse feature at the Station in sessions of high rainfall like the past five, was greatly reduced in 1955-56 by planting the crop on land which had been ploughed on the bed-and-finishing-furrow system of cultivation.

With waterlogging and insect pests under reasonable control it should now be possible to maintain steady progress in the breeding and selection of strains.

BAR 4/18 G. barbadense. The long-term programme started in 1953-54 in which the bacterial blight resistant gene B_6m is being transferred from BAR 4/18 to *G. hirsutum* strains yielded seed of the second backcross in 1955-56. S 47/9, a very early prolific strain of 9L34 lineage, was used as the recurrent parent in making the second backcross.

Bulk selections for earliness and yield were made in the F_2 lines derived from the original 19 53-54 crosses between BAR 4/18 and *G. hirsutum* strains.

The Albar Strains and Crosses. Seed of Albar 51, of the F_3 and first and second backcross between Albar 51 x (MU8A x BP52*), and of similar backcrosses with Albar 49, was treated artificially with bacterial blight cultures before planting. Seedlings which developed symptoms of the disease were removed at thinning-time about three to four weeks after germination. Subsequently, the remaining plant population was subjected to a leaf spray treatment at about 45 days and again at 75 days after germination. Plots were again rogued when only plants showing no symptoms of the disease were retained. The remaining plant population was examined for jassid resistance at 120 days.

Having subjected the Albar material to the treatments described, a total of 194 single plants were selected in the field. Seed cotton from these plants was analysed for halo length and lint and seed indices. Finally, 14 single plants were selected. Of these, seven were from Albar 51, five from Albar 51 single cross and two from Albar 51 backcross.

Seed of the remaining 180 plants will be bulked according to lineage and planted in 1956-57 for further selections.

Single plants from similar Albar strains and crosses were selected from plots grown at the Sabi Station, but in this instance selection pressure was applied mainly on the basis of the analysis of lint and seed characters. At Sabi, artificial application of the bacterial blight organism and subsequent examination of the plants for resistance, as conducted at Gatooma, was not possible in 1955-56.

U4 Progenies. From a total of 99 selections, derived from all sources, and planted in non-replicated progeny rows in 1955-56, 32 lines have been retained for further trial, after applying selection pressure for jassid resistance, yield and seed cotton characters.

Furthermore, a total of 118 plants were taken from 9L34 Modal Bulk 3, formed in 1955. Having carried out the appropriate analyses, 9L34 Modal Bulk 4 has been constituted. Seed of four single plants has been retained from this source, for planting in the non-replicated rows in 1956-57.

Progenies other than the foregoing. Additional to the BAR 4/18, Albar, and U4 material already mentioned, 11 selections from (MU8 x BP52*) F_5, seven from (MU8A x BP52) F_5, and three from MU8A x Acala F_5 are being carried forward, mainly because of good yield potentialities. The material is susceptible to bacterial blight, but the best of it for other desirable characters, will be selected for crosses with Albar.

Trials, Cotton Plant Breeding

U4 Replicated Progeny Trial. The trial contained 14 selections from 9L34, the commercial variety 9L34 itself; and 9L34 Modal Bulk 2. The trial was sown at Gatooma and at the Sabi Valley Station.

The Gatooma trial received 12 weekly applications of Endrin, at 0.25 lb. active ingredient per acre on each occasion. The Sabi trial received eight applications of 10% DDT+3% gamma BHC dust at the rate of 10-15 lb. per acre per week, from the start of budding.

Plant stands in the Gatooma trial were fairly good and plant development was reasonable. In the Sabi trial, however, stands in certain plots were definitely poor, probably due to the inhibiting effects of soil crusting on seedling emergence, or possibly due to a combination of crusting and inherent strain differences in germination. Different methods of reducing soil crusting at the time of seedling emergence in certain Sabi Valley soils are being tested.

However, the mean yield of the Sabi irrigated trial was 1,381 lb. seed cotton per acre and the mean yield of the Gatooma trial, under rainfall conditions, was 683 lb. seed cotton per acre. There was much less stained or discoloured cotton in the Sabi Trial.

Although yields were higher at Sabi, the G.O.T. percentage, and seed and lint indices were lower than at Gatooma. On the other hand, seeds per boll and halo lint length measurements in the Sabi trial were greater than at Gatooma.

Certain strains, from the U4 Progeny trial, in which both yield and quality of seed cotton are promising, will again be under trial next season at both Stations. Similarly, a number of selections have been taken from the better strains and these will be tested.

Replicated Progeny Trial No. 2. Out of a total of 44 progenies, derived mainly from MU8A x BP52 sources, and compared in a trial at Gatooma, five from BP52, four from A5851, five from A618 and three from MU8A x BP52 F_6 have been retained for further investigation. All of these cotton strains are susceptible to bacterial blight, but the best of them for yield and quality will be used in the hybridization programme. The mean yield of the trial, obtained with the aid of applications of Endrin, was 540 lb. seed cotton per acre.

Preliminary Variety Trial. In this trial, which was planted both at Gatooma and at the Sabi, promising newly introduced strains are compared with a number of Gatooma selections.

Insecticidal treatment of the two trials was similar to that described for each of the U4 Replicated Progeny trials at the two Stations.

The Sabi trial, first planted on the 10th November, germinated very poorly, and it was replanted on the 9th January, 1956. Despite this, yields from the later planted trial were fairly good, even for irrigated cotton.

The mean yield of the whole Sabi trial was 1,422 lb. of seed cotton per acre, while that of the Gatooma trial was 797 lb. 9L34 yielded 1,186 lb. and 772 lb. seed cotton per acre at Sabi and Gatooma respectively.

Top-yielding varieties in the Sabi trial were Nyasaland CL 20 with 1,802 lb. and CL 20 filter with 1,716 lb. seed cotton per acre. Third and fourth positions for yield were occupied by two Albar 51 strains. The yield of the four strains was significantly greater than 9L34.

In the Gatooma trial, strains of Albar 51 occupied the first four places for yield, the highest yielder being Albar 51/637 with 1,059 lb. seed cotton per acre. The yield of the four Albar strains was significantly greater than 9L34.

District Variety and Small Bulk Trials. There were District Variety trials at nine centres at six of which there were also Small Bulk Trials.

Half of each District Variety and the whole of all Small Bulk Trials were sprayed with a mixture of DDT and BHC. Where the spray was applied leaf development was soon markedly distorted and destroyed, due probably to the breakdown of the BHC component. For this and other reasons no useful results were obtained from the District trials in 1955-56. Nevertheless the trials will again be planted in 1956-57 when Endrin will be applied to control insect pests.

Multiplication Bulks. Strain S52/36, a 1952 selection from 9L34, has shown considerable promise in Replicated Progeny trials as well as in District Variety and Small Bulk trials in recent seasons. Spinning tests on the lint of the strain have also been satisfactory. Therefore, it has been decided to multiply the strain with a view to its replacing 9L34 in commercial cultivation. Approximately 15 acres of S52/36 will be grown under irrigation at Humani Ranch in the Sabi Valley, and a further five acres will be planted at Gatooma. Insecticides will be applied in both instances.

Rhodesian cotton growers, at a meeting of their Association in September, generously agreed to pay for the cost of the insecticide to be applied at Humani Ranch. The seed obtained from the multiplication bulk of S52/36 will be for general distribution to growers as G52/36.

Cotton Insect Pests

In outline, the course of pests attack through the season was as follows:—

In plots of standover and ratooned cotton, a few small Red bollworms were found in September. This principal pest became more numerous in October, but the first fifth instar larva was not taken in the crop until the last week of the month. Spiny bollworms were recorded frequently in September and October, but American bollworm was found only occasionally.

Subsequently, in the period November, 1955, to January, 1956, Red bollworm was taken consistently, but the occurrence of Spiny and American bollworms was variable, more especially were there few of the two latter pests in December.

It should be emphasized that had the cotton plants been destroyed before the first day of October, as is at present required by law, the pest population recorded in the ratooned cotton plants would not have materialized.

In the annual crop, planted within a few days after the 21st November, 1955, records of pests were taken from the end of January and during February, but during March abundant moisture conditions in the lands caused a suspension of record-taking.

In the annual crop, Red was the most numerous bollworm throughout the season. Numbers of American and Spiny were smaller but the former bollworm increased towards the end of March and early in April.

Stainers were present in the crop from mid-February onwards.

Jassid and Aphid occurred only in cotton which was not treated with insecticides.

Red spider did not appear in the crop until the end of April, too late to cause damage.

Insecticide Trials. In a season of heavy, and at times continuous rainfall, such as occurred in 1955-56, there must have been a considerable washing off and therefore loss of the effectiveness of the insecticides applied. There was also a suspension of insecticidal applications during most of March, on account of rainfall.

Nevertheless, that certain insecticidal treatments applied were effective in increasing the yield of cotton economically is shown in the results of the following trials, in which the plants flowered mainly in February and March.

Insecticide Trial No. 1. In this trial Endrin, and Endrin in combination with DDT as sprays were compared with DDT dust and a combination of DDT and BHC as a spray and as a dust. The programme included eight applications of the insecticides to be applied, one each week, rainfall permitting, from the start of budding, on the 18th of January. Application was by pressurized hand sprayers. In practice, the first six applications were made with an interval of one week between each. There was then an interval of three weeks between applications six and seven, and another of two weeks between the seventh and eighth applications. The main results of the trial are as follows:—

1. All emulsion spray treatments gave significantly higher yields than dusts and than the untreated plots.

2. All emulsion treatments showed a profit over the untreated plots after deducting the value of the seed cotton obtained from the untreated plots and the cost of the insecticide.

3. The most "profitable" treatment, experimentally, was that due to eight weekly applications of 0.25 lb. Endrin (active ingredient) per acre as a spray. The mean yield of the plots receiving Endrin was 650 lb. seed cotton per acre, which was significantly better than the 260 lb. obtained, from the untreated plots. The calculated profit due to Endrin, as described, was approximately 138/- per acre.

4. From records of the occurrence of the three bollworms it would appear that the yield increases obtained from the emulsion treatments were due to the control of Red and Spiny bollworms in the boll stage.

Insecticide Trial No. 2. In this trial an attempt was made to determine the optimum time, the interval, and the number of applications necessary when Endrin was applied as a spray at 0.25 lb. per acre on each occasion of treatment. Rainfall interrupted, somewhat, the programme as planned, but the main results of the trial are as follows:—

1. All treatments showed a profit over the untreated plots, the profit ranging from 56/- to 141/- per acre.

2. The highest profit, namely 141/- per acre, was obtained by making eight weekly applications of 0.25 lb. Endrin per acre from first buds as weather permitted. The mean yield from the Endrin treated plots was approximately 515 lb. seed cotton per acre compared with a yield of 150 lb. from the untreated plots. The difference in yields was statistically significant.

Sabi Valley Insecticide Trial. In this trial certain comparisons were made between Endrin, Endrin+DDT as sprays, DDT as a dust, and DDT+BHC both in spray and dust forms. Furthermore, the series of insecticide treatments were applied with seven-day and also fourteen-day intervals, both from the start of budding. The main results are:—

1. All insecticidal treatments significantly outyielded control.

2. The most economic treatment was six applications of 0.25 lb. Endrin per acre with fourteen-day intervals between applications. In this instance, it is calculated that the profit due to insecticidal treatment was approximately £28 per acre. Although the treatment did not result in the highest profit per acre it offered the best return for the money expended on insecticide.

The Endrin treated plots yielded at the rate of approximately 1,870 lb. seed cotton per acre compared with a mean yield of 1,070 lb. from the untreated plots, a difference which was significant.

3. An increase in the interval between applications of from seven to fourteen days correspondingly increased significantly the staining percentage from about eight to sixteen per cent. However, in the fourteen-day interval plots staining at about sixteen per cent. was significantly less than in the untreated plots in which staining was about thirty per cent.

Bacterial Blight Disease. Infection of plant breeding material, where applicable, was induced artificially by soaking seed in a suspension of the *Xanthomonas malvacearum* before planting, and later by spraying the foliage of plants with the organism in suspension.

A trial designed to assess the reduction in yield, and possibly the amount of staining, caused by bacterial blight gave a mean yield of 535 lb. seed cotton per acre. Statistically significant results were as follows:—

Two treatments, firstly, machine delinted seed treated with Perenox (the plants being untreated), with a mean yield of 602 lb. seed cotton per acre, and secondly acid delinted seed treated with Agrymicin (the plants being also treated), with a yield of 570 lb., gave higher yields than either acid delinted seed, both seed and plants being artificially infected with bacterial blight, with a yield of 474 lb. seed cotton per acre, or untreated seed and plants derived from machine delinted seed, with a yield of 469 lb.

There were no significant differences between treatments in either staining percentages or in earliness.

Cotton Agronomy Trials

In this group of trials losses caused by insect pests attacks have in the past often masked real yield differences between treatments. Therefore, it is now hoped that, in future, pests will be controlled by applications of Endrin and the value of results from agronomic, as well as other trials, will be enhanced.

The following trials gave no significant differences between treatment yields:—

1. A spacing trial with combinations of 2 feet or 3 feet spacings between rows and a 6, 9, or 12 inch spacing between plants in the rows.
2. A trial to test the effect of the addition of minor elements to the soil.
3. A trial with applications of N.P. and K. fertilizers to ratooned cotton.

Statistical significances however were obtained between certain treatments in the following trials:—

1. In comparisons between certain cultural methods, weed growth, encouraged to develop among the cotton plants throughout the season with the object of reducing waterlogging, reduced yields markedly to 27 lb. seed cotton per acre. Waterlogging did in fact occur in the area of the trial.

2. In two factorial 3^3 placed N.P.K. fertilizer trials which received insecticide treatment, mainly in the form of Endrin spray, the level of yields in plots to which no fertilizer was applied was approximately 420 lb. seed cotton per acre in both trials, compared with yields of 700 lb. and 900 lb. from plots receiving the full $N_2P_2K_2$ treatments. General mean yields in these trials were 550 lb. and 660 lb. seed cotton per acre.

In the larger of these fertilizer trials the linear effect of NP and K was statistically significant. This result was not entirely confirmed in the second smaller fertilizer trial, planted in the same land, but which received a greater number of applications of Endrin.

In two 3^3 factorial fertilizer trials on sandveld in the Mondoro Reserve the cotton plants were very badly damaged by the BHC component of a DDT BHC spray, applied to control insect pests. The mean yield of the trials, one received a uniform dressing of dolomitic limestone while the other did not, were approximately 133 lb. and 147 lb. seed cotton per acre respectively. Significant differences between certain treatments were obtained in the yield of seed cotton, but in the circumstances, these must be treated with reserve.

Although the crop set was meagre and patchy, the plants eventually recovered from the insecticidal damage, and marked differences in growth between treatments were observed. Applications of dolomitic limestone, nitrogen and phosphorous increased plant weight but potash applications did not.

Crops other than Cotton

Legumes. Ninety-eight plots were planted to different varieties and strains of legumes on the 10th January. Lack of rainfall seriously affected germination causing delay and patchiness of plant growth. Subsequently, heavy and prolonged rainfall in February and March caused waterlogging in this particular land and plant development was further delayed. The following main adverse observations were made during the season:—

1. The Velvet Bean varieties were all killed by stem rot.
2. In the cowpea plots susceptible varieties were affected by *Elsinoi.*
3. Harricot beans were destroyed by stem maggot.
4. The lucerne plots all carried a heavy infection of *Uromyces striatus.*
5. Conditions generally proved unfavourable for the growth of cluster beans, sugar beans, Canadian wedge peas and lupins.

Healthy growth and good yields were produced by *Crotalaria*, Pigeon Peas, *Canavalia*, Soya Beans, *Sesbania* and *Desmodium*. Insect pests affecting the pods greatly reduced yields of seed in the *Crotalaria* and *Canavalia* plots.

Maize Stubble Mulch Trial

This experiment, which it is planned to run for several seasons, is designed to assess the effect of stubble mulching, trash ploughed under and trash removed prior to ploughing (clean ploughed), on yield and on the incidence of *helminthosporium*, various cob rots and maize stalk borer.

Each of the three cultivation treatments received application of 0 lb., 200 lb. and 400 lb. per acre of sulphate of ammonia, half of the fertilizer being applied at land preparation and half when the maize was knee-high.

The yields between the clean ploughed and the trash stubble mulched treatments, significant at each level of sulphate of ammonia application, were as follows:—

Sulphate of Ammonia	0 lb.	200 lb.	400 lb. per acre
Clean ploughed	9·9	15·6	18·4 bags per acre
Stubble Mulched	6·2	12·6	12·6 bags per acre

Miscellaneous Trials. Results of other trials planted, maintained and harvested at Gatooma in 1955-56, on behalf of other Research Stations and Branches in the Department are given in the reports of the officers concerned. The trials were: Maize hybrids trial; summer and winter observation plots of wheat varieties from the Salisbury Experiment Station; a sorghum trial for Matopos Research Station; and a sunnhemp disease treatment experiment for the Branch of Botany and Plant Pathology.

CHEMISTRY BRANCH

DR. B. S. ELLIS
Chief Chemist

The past year's decline in the number of samples analysed reflects to some extent the situation caused by the numerous staff changes which took place. In the period under review more chemists left the Branch than in its entire previous history, excluding those who have left on normal retirement. In staff matters it is with very great regret that I have to record the death of Mr. J. F. Duguid who had retired from the post of Senior Chemist on abolition of office only a month or two before. Mr. Duguid had been attached to the Chemistry Branch for 25 years and during all that period, even at times of great suffering and illness, worked with untiring industry. As a colleague he combined wide cultural interests with warm human sympathy and understanding to a remarkable degree, and his passing was deeply mourned by all. Among others who left during the year were Mr. H. M. Murray and Miss Giffard on abolition of office, Mr. R. Salmon, who resigned because of dissatisfaction with the Federal terms of service, and Mr. Hall. Mr. Soane was transferred from the Soil Survey Section on secondment to the Sabi Valley Experiment Station and Mr. Ryding on secondment to Conservation and Extension. With the further transfer of Mr. Thomas to Soil Testing consequent upon Mr. Duguid's departure, the Soil Survey Section was left seriously understaffed. From an efficient highly trained field force consisting of Mr. Thomas with five specialist officers, it has been reduced to Mr. Thompson with one Professional Officer. The position is very serious indeed with four vacancies unfilled, and we are quite unable to meet our minimum agreed commitments, let alone the continually expanding demand for essential surveys. Of our firm commitments a three-year survey of the Zambezi Valley is probably the most important. Even with the most optimistic view of recruitment the Soil Survey Section will remain crippled for at least two years, with untrained staff, and with no guarantee of permanence when their minimum training is complete at the end of that period. We must resist any further transfer of men from this vital service, which even when fully staffed was inadequate for the demand made on it. Men who have been trained in soil survey work are of undoubted value to other Departments, but provision should be made for staff under this head (those who are subsequently to be seconded) without drawing on the irreducible minimum which constitutes our establishment.

The staff movements of the year had their most immediate impact on the Soil Testing Section when at the busiest time of the year Mr. Thomas, recently removed from Soil Survey, faced the annual rush of samples with a virtually new and untrained staff. Apart from re-organization of procedure the work involved in the incubation technique has been increased and a vastly larger number of test samples to maintain the accuracy of the general analytical methods has been introduced. In the circumstances some accumulation of both samples and reports was to be expected but it is now hoped that all reports will have been submitted by the dates promised. Tribute must be paid not only to the overworked staff but also to the farmers who, whatever the disappointment and delay, accepted the situation with understanding.

The hope expressed last year is now a reality, if not fully materialised, and when the next annual report is written it will refer to a season's work in the new soil testing laboratory, which will not only provide improved facilities for soil testing but will relieve serious congestion in the main laboratory block.

All sections suffered from staff difficulties but the long leave of the Chemist associated with pasture research aggravated a position already serious. The necessary restrictions in the numbers of pasture research samples referred to last year were not adequately enforced, although all the stations were advised. A Technical Assistant will soon carry out routine analyses at Grasslands, but in any case the accumulation of samples has meant and will mean some curtailment in the important and rewarding work associated with digestibility trials at Henderson. While on leave the Chemist, Mr. A. G. Croft, studied the latest techniques used in this work in the U.K.

The main emphasis of research, which has proceeded as vigorously as circumstances allowed, has been on the availability of nitrogen and the methods of measuring it. It is very regrettable that there has to be any curtailment of this vital and important work and every effort will be made to continue it with as little interruption as possible. Dr. Saunder, again with inadequate staff, continues in charge of this work which is at the very core of our advisory activities.

With its progressively contracting staff the Soil Survey Section carried out a variety of tasks, not perhaps as wide as in previous years but of equal interest and importance. The most notable and difficult was, in advance, thought to be the large-scale reconnaissance of the Sebungwe area for the Native Department, but in the event this was disposed of fairly readily. The most significant achievement, for which Mr. Thomas returned temporarily to his former section, was in collaboration with the Department of Conservation and Extension in devising suitable land capability classes for farm planning and in listing and coding the significant soil characteristics which determine the classes so that they could be recorded and applied in the field by Conservation Officers who are not trained pedologists. Mr. Ryding was seconded to Conservation and Extension as advisory officer but all senior members of the staff have contributed very greatly to the detailed soil courses which are held in the Chemistry Branch. Much credit is due to all officers concerned and to Mr. Vincent and Mr. Hack of the Department of Conservation and Extension, for this happy co-operation, and for a realistic system of farm planning, based on soil characteristics, which meets the criticisms we have been voicing for several years. Another feature of very considerable significance was the visit of Dr. Lyle T. Alexander, a very senior officer of the Soil Conservation Service of the U.S.A. who with our pedologists and invited pedologists from the Union and N. Rhodesia, examined pits in selected soils in different parts of the country and discussed their classification.

After leave in Britain I investigated the application of the British Fertilizers and Feeding Stuffs Act there, and found it to be little better than our own, if as good. I then attended the International Soil Congress in Paris, where in spite of the superfluity of papers and the poor quality of some of them, much was gained through personal contacts, the value of which is impossible to exaggerate. I met, and discussed soil problems with, all the leading authorities of the world today: I discovered, or rediscovered, that our own work is up to the highest world standards and that it is receiving increasing attention everywhere which makes it all the more regrettable that staff difficulties, in many cases avoidable, should delay our progress in any way.

Laboratory Analytical Work

The following table gives a classification of the samples analysed during the year under review together with those of the previous year (1954-55.)

	1955/6	1954/5
Soils	2,706*	2,570
Farm Feeds	203	144
Manures and Fertilisers	101	310
Vegetable Products	164	235
Waters	106	158
Limes and Limestones	18	4
Toxocological	496	565
Meats	—	16
Miscellaneous	131	228
Pasture Research	1,545	1,443
Investigatory and Research	620	1,123
Soil Survey	229	350
TOTAL	6,109	7,146

* Includes 220 soils listed under Investigatory and Research which passed through Soil Testing Procedure. These soils are reflected only once in the total.

This represents a decrease of 1,137 samples as compared with the previous year. In connection mainly with soil testing some 950 interviews were given to farmers and others.

Soils for Advisory Work. Little of significance emerges as this unfortunate method of recording covers testing for two growing seasons. The number of samples for tobacco remains, if very slightly down, roughly the same, with other crops showing some increase. In the case of tobacco it is clear that many farmers who have had their soils analysed for the past two or three years now

believe they know the characteristics of their soils sufficiently well to make their own accurate recommendations. Many growers are submitting soil samples for the first time.

Toxicological. Of the 496 samples in this category 461 were post-mortem specimens of animals or of feeds and materials consumed. Half the tests were positive and the large majority were cases of arsenical poisoning, which indicates that dip is still largely used and still very carelessly handled.

Manures and Fertilizers. As last year, guanos formed the largest section under this head. It is to be hoped that the decrease of 209 samples here reflects an increased submission by the industry to the private analyst who has begun operations in Salisbury.

Farm Feeds. An increase in farm feeds samples is accounted for by investigations into agalactia in pigs and by a large number sampled under the Act.

Vegetable Products. Included under this head were numerous silage samples from a country wide survey by the Department of Conservation and Extension, maize samples from the Salisbury Experiment Station, fodder crops, apples from Inyanga, and tobacco leaves. Of the tobacco leaves some were for mineral uptake, some from commercial firms for sugar and nicotine.

Waters. The hoped-for taking over of silt samples from the Ngesi Dam, by the Hydrological Branch, mentioned last year, has taken place. Most of the waters analysed were submitted by farmers for an assessment of their suitability for irrigation.

Limes and Limestones. An increase in limes and limestones may reflect a greater use of these materials or a closer check on materials submitted for sale.

Miscellaneous. This amorphous group for once reflects investigations of some importance. For example as part of an investigation into the composition of milk, twenty-eight seasonal samples of milk were analysed for the Dairy Branch. Twenty-four iodine dip testing solutions offered for sale were checked for the Veterinary Branch, and among a rare assortment of oils and fats 27 samples of tung oil were exhaustively analysed on behalf of the Department of Agriculture, Nyasaland.

Research and Investigatory Work

Of the 610 samples dealt with a little less than half were in connection with nitrogen availability and uptake and a mere handful were to do with trace element deficiencies or toxicities. For field trial and fertility investigations 153 samples were from Government research stations, 87 from Conservation and Extension, 14 from the T.R.B., and 28 from other sources. Of the 28, 4 were from Native Agriculture, 12 from Tanganyika non-Native T.R.B., 2 from the Mazoe Citrus Estate and 10 from the Mazabuka Pasture Research Station.

Samples from field trials on Research Stations were made up as follows:—

Salisbury Experiment Station	94
Grasslands Research Station	36
Matopos Research Station	10
Sabi Valley Research Station	9
Gwebi College	3
Henderson Research Station	1

It is clear that co-operation will all research stations is by no means satisfactory. There are obviously many experiments and field trials which are not yielding the information they should because samples from them are not received. It might appear that there is a need for a liaison agronomist on the lines of the Pasture Research Chemist but with more clearly defined powers, to correlate this work and ensure the necessary submission of samples and of detailed results.

Research Work. Most of the analytical work involved in the analysis of the samples was carried out in the routine soil analysis laboratory.

The correlation of the analytical and field data will be carried out when the results are available and will be used to improve the criteria used for making fertilizer recommendations in different areas.

Work is continuing on the development of the incubation procedure, in particular on methods of dealing with complications arising from the presence of unrotted organic matter and on the quantitative allowances to be made for such material. Apart from the use of field crop data for this, an experiment has been initiated to test, by means of pot experiments, the precise quantitative effects on N availability of turning in grass (on virgin and improved lands) at different stages on both red soils and on sandveld. The cropping tests will only be carried out during the coming season and results are therefore not yet available. Unfortunately owing to staff shortages it has not proved possible to carry out this work according to the full statistical plan and it has proved necessary to combine replicates.

Lysimeters to test the release of nitrogen under different climatic conditions were again installed at Inyanga, Rusape, Salisbury, Shamva and Northern Rhodesia. The results have not yet been examined.

The work on the infertility of certain dyke soils reported last year was continued, and the results are now being prepared for publication.

Two papers, on the procedures used for determination of available phosphorus and available nitrogen respectively, were prepared and have been accepted for publication, one by Soil Science and the other by the Journal of Soil Science.

The procedures used in the assessment of fertilizer recommendations were completely revised and redrafted for the 1956 season, and a paper on the fertilization of maize, in which these procedures were briefly outlined, was presented at the Annual Conference of the Department of Research and Specialist Services.

In addition to the work carried out in the Research Section, Dr. Weinmann carried out investigations into the nitrogen uptake of tobacco, of munga and of a munga-sunnhemp mixture. It is hoped to continue this work during the coming season. Preliminary results indicate a lower uptake of nitrogen by flue-cured tobacco than is found elsewhere.

Soil Survey

Before the field season started samples from the Sabi Valley survey of the previous year were analysed and maps and reports prepared on the west bank from the Turgwe River to the Sangwe Reserve. As in the previous year separate irrigability and pedological maps were made. Although new series were described and named the scale of operations did not permit of their individual use for mapping purposes. Very necessary analyses in connection with granite soils and with the fundamentals of soil classification could not be completed because of the commitments which inevitably arise and for which extreme urgency is always claimed. This year the most worrisome of these distractions was a reconnaissance survey of over a hundred farms in the Salisbury area, for the Town Planning Department.

The main assignment of the field season, already referred to, was the land use survey of the Sebungwe area for native settlement made necessary by the flooding which will follow the completion of the Kariba Dam. Due to late rains the operation did not start until the beginning of June and was completed at the end of August. The satisfactory survey of the potentialities of this vast area in the time was made possible by the use of aerial photographs, with ecological associations confirmed by pedological examination on the ground.

The co-operative work with Conservation and Extension on precision in assessing soils and their land use capability classes for farm planning has already been described, as has the visit of Dr. Alexander from America. Following Dr. Alexander's visit and a full day's discussion of classification problems, the pedologists of the Branch had further very informative talks with the representatives of the Union and of N. Rhodesia on the examination of soils for their suitability for irrigation.

Mr. Thompson visited N. Rhodesia for two weeks with representatives of the T.R.B. The tobacco producing areas in the Southern and Central Provinces were examined with a view to the establishment of a Tobacco Research Station in the North.

Other field duties, too small and numerous to mention in detail included visits to small-scale irrigation schemes, to Research Stations, to Chirundu Sugar Estates, and even (in an archaelogical capacity) to the communal grave of the Marlborough Man, to see if soil conditions could indicate the age of the remains.

Pasture Research

The number of samples analysed was 1,545 of which 1,104 came from Grasslands, 348 from Henderson and 83 from Matopos. The samples were made up as follows:

Herbage (grasses, hays, legumes and browse)	1,254
Silage	34
Roots	18
Samples from Digestibility Trials at Henderson, faeces and feeds	87
Manures and Composts	34
Limestones	2
Soils	33
Waters (from lysimeter experiments)	19
Maize grain samples	64

There is a serious backlog of work in this section, with over 1,300 samples awaiting analysis, in the laboratory. In addition there is an accumulation of more than 200 samples from the digestibility trials at Henderson. There will in certain cases have to be a complete halt in the submission of samples.

I must, as in the past, end this review by expressing my thanks to the staff who have, during the period, battled with more than usually trying circumstances: in particular I must mention Dr. Weinmann who acted as Chief Chemist in my absence.

ENTOMOLOGY

J. A. WHELLAN
Chief Entomologist

Introduction

The functioning of the Entomological Branch has been hampered even more than in recent years by a shortage of professional staff. The Chief Entomologist, Mr. M. C. Mossop, A.F.C., retired in October after over 25 years of service. From then until February, when Mr. C. N. Smithers joined the staff as entomologist, Mr. D. J. W. Rose was the only entomologist other than the Chief Entomologist, working in the branch. At the beginning of September Mr. Rose was transferred to Gatooma to inaugurate long term entomological research on cotton pests there, so that again at the end of the year only two entomologists were working in the Branch. During the busy months of December and January, however, the entomologists were materially helped by the temporary employment during their vacation of two University students of entomology. Under these circumstances it is not surprising that the output of original work from the Branch has been very small and no early improvement in this can be anticipated.

Fortune did not smile on the limited staff by limiting the attentions of insect pests accordingly. The Khapra beetle, discovered only last year, increased inordinately both in numbers and range. A moderate outbreak of army worm commenced early in December and continued more or less continuously well into February. Observations on army worm were materially helped by the light traps which have been installed.

A great deal of time has perforce been spent on the attempt to secure unitary legislation throughout the Federation on all subjects which were administered by the Branch under the old Southern Rhodesian Plant Protection Act. The main matters concerned here are plant imports and tobacco pest suppression. While agreement in principle has been a simple matter it is still likely to be some months before the new legislation takes effect.

The Branch has again helped the International Red Locust Control Service, to which the government makes a substantial financial contribution, with administrative matters. The annual Council meeting, held at Abercorn in July, was attended and it was apparent that developments in technique, particularly those arising from the more extensive use of aircraft, enable the service to look to the future with a greater measure of confidence than ever before. A new vehicle, the Swamp Skipper, has been tried out and has proved invaluable for scouting. It is completely amphibious and so can traverse the extensive swamps in which the red locust breeds, and it has the further advantage of having a very high seat enabling a good field of view to be obtained over the very long grass which covers much of the outbreak area.

A satisfactory year's working was also recorded by the organization working on the control of the African Migratory Locust. Its annual Council meeting held in Paris was attended on our behalf by the Scientific Liaison Officer in London and at this meeting the permanent international organization was set up with the title "Organisation internationale contre le Criquet migrateur africain". (O.I.C.M.A.)

Research

The information gained from the light trap established last year at Salisbury made it apparent that an extension of this means of assessing the occurrence of insects, particularly lepidoptera, was very desirable. Light traps were accordingly set up at the research stations at Gatooma and Marandellas. It has, of course, not been possible to give these traps the same thorough supervision that the one at Salisbury receives so that the results from them have been correspondingly less. Nevertheless they have given useful information, including the negative item that the cotton red bollworm which is numerous in the vicinity of the Gatooma light trap, appears to be only very slightly attracted to light. It was, however, very surprising that, during the army worm outbreak which was centered in the Hartley-Gatooma area, no very substantial army worm catches were made by the Gatooma trap, while at Salisbury, where the outbreak was less severe, some very large catches were made. A possible explanation is that the large catches at Salisbury resulted from migrating swarms—this supposition fits in well with subsequent army worm occurrences—while perhaps no such swarms travelled within range of the Gatooma trap. The two main catches of army worm moths at Salisbury took place on the 22nd December and 9th and 11th January and showed some interesting features. The moths of the December catch were more or less evenly sexed and the females, samples of which were dissected, were not ready to lay eggs. This was taken to indicate that the moths were part of a migrating swarm which might be expected to fly further before laying eggs. This information was used to give a warning in the press and over the radio of the likelihood of an outbreak. Such an outbreak, centred in the Norton area, in fact occurred about a week later. By contrast the moths of the January catches were nearly all males and the few females caught were found on dissection either to have already laid eggs or to be ready to do so. This was interpreted as meaning that if these moths also represented a migration they had reached the end of their travels and the females, being busy ovipositing, were no longer attracted to light. Any outbreak of larvae might then be expected to occur in the Salisbury area and in fact newly hatched larvae were found on the Agricultural Experiment Station a few days later. On this

occasion no warning was issued as well grown larvae were already quite plentiful in the Salisbury area at the time the moths were caught. This leads to a consideration of another unusual feature shown by this outbreak. The first army worm larvae were found at Mount Darwin on irrigated maize early in November, earlier in the season than they have been previously recorded. The next reports came early in December and thereafter until mid-February they could be found in many areas in various stages of development almost continuously. Some areas received a succession of attacks. This contrasts with previous outbreaks where more or less sharply defined generations have succeeded each other at regular intervals and where two attacks in the same locality have been regarded as exceptional. It now seems that supposed relative immunity from attack once an initial attack has been experienced is quite unreliable and cannot be reckoned with in planning control. Much more information is, however, required on this.

During the outbreak an opportunity was taken to test a new insecticide, endrin, and it was found to be very effective against army worm and about as economical as any of the older established insecticides. There is now no difficulty in controlling army worm by synthetic insecticides and future research along these lines will largely need to be directed towards reducing costs, which are considerable, especially if more than one attack is experienced. After the main outbreak had died down few army worm moths were caught but a very significant capture of a female moth was made by an entomologist in mid-June. This laid eggs and of the ensuing larvae the only survivor, which was kept throughout under natural conditions, developed slowly reaching maturity on the 31st August. This does demonstrate that, provided a food supply is available, army worms can develop in the climate of Salisbury at any time of the year. Thus observations this season give further support to the hypothesis that army worms both live continuously, at least in parts of the country, and are at times reinforced by influxes of migrants.

It was not possible to give the cereal stalk borer problem the attention it merits. An attempt was made to carry out trials on the comparative efficacy of various insecticides against maize stalk borer but, because of a uniform low stalk borer attack on the trial plots, nothing came of this. The Branch co-operated in an experiment carried out at Gatooma to ascertain the effect of stubble mulching on maize stalk borer populations. The results are somewhat inconclusive and, because the experiment may not have been designed in the best manner for this kind of trial, need to be interpreted cautiously. The only positive result which seemed to emerge was that increasing the application of nitrogen to the crop led to an increase in stalk borer attack. This is, of course, understandable since the greener more succulent plants might be expected to be more attractive.

A study of the life cycle of the maize stalk borer has been commenced mainly with a view to finding out exactly what happens during the winter months and how this may be expected to be affected by irrigation. The commonly held view that pupation takes places mainly at the base of the stems has been found to be by no means universally true and far more pupae are actually found at higher levels. The diapause in the overwintering larva proves to be a very fixed thing and no means of breaking it has yet been found. This contrasts with the overwintering of the napier fodder borer, which has no true diapause.

An interesting borer of the genus *Chilo* has been found in rice, and another, not yet identified, in wheat at both the Sabi and Salisbury Experiment Stations.

It has now been established that the green bush locust has a two-year life cycle, the delay taking place in the egg stage. Eggs kept under observation took 51 weeks to hatch and hatched in the middle of the rainy season. There is, however, overlapping from place to place and, especially in the Salisbury area, there is because of this no very clearcut alternation of years of scarcity and abundance such as occurs at Selukwe.

The green stinkbug proved to be far more troublesome in tobacco than has previously been observed. An examination of the life-cycle of this pest, which seems to overwinter as an adult, is being made. A small supply of its eggs parasitized by a tiny chalcid wasp was obtained from South Africa. These were bred and increased and, towards the end of the rainy season a few trial liberations were made in localities where the green stink bug was known to be numerous. An attempt was made to carry some of the parasites through the winter but, as no method of inducing the stink bugs to lay eggs at this time was found, this failed. An attempt will be made, however, to obtain recaptures of the parasites in the places where the limited releases were made.

Further trials of the efficacy of insecticides against cotton pests were made. The results at Salisbury were rather inconclusive due to the low incidence of bollworm attack. An entomologist was seconded to Gatooma Research Station at the beginning of September to commence full time investigations on this problem. The earlier trials have been of a rather empirical nature but they have shown the feasibility of controlling cotton pests by synthetic insecticides. Having established this it is now intended to carry out more fundamental research with a view to ascertaining the most practical and scientifically sound method of achieving control. A previously unknown pest of cotton, a beetle which ring barks the stem causing the plant to fall over, has been found at the Sabi Experimental Station. What its economic significance is likely to be is not at present known but its life cycle is being investigated.

A great deal of time and attention has been given to the Khapra beetle, which, since its discovery in February, 1955, has increased to such an extent that it is now quite the most imporant

pest of stored grain in the Federation. Three factors in its bionomics have necessitated radical changes in our approach to the problem of controlling stored grain insects. Firstly this insect is resistant to most insecticides so that treatments previously recommended avail little. Trials with the new insecticide malathion are very promising. Secondly its larvae, which are very prone to hide in crevices, can live for many months and probably for more than a year without food. Thirdly the temperatures generated in grain stacks are not high enough to interfere with its breeding so that there is little appreciable movement of the insects to the outside of the stacks. This gives rise to the problem of water translocation and consequent development of moulds in infested stacks and makes fully effective fumigation of infested grain with methyl bromide imperative. This has shown up faults in the arrangements made for fumigation which have still not been satisfactorily solved though the situation in this respect has improved a great deal during the year. The problem is aggravated by the good grain crops of the last few seasons which have rendered inadequate the available facilities for grain storage and have made effective storage hygiene almost impossible and especially the segregation of clean and infested grain. The Branch has been greatly helped in this work by Dr. K. Salmond who, despite a full programme of work on stored grain in Northern Rhodesia, has made periodic visits and carried out experiments which have very materially assisted the progress made towards a solution of this problem.

Occurrence of Insect Pests

The outbreaks of army worm and green stinkbug which have already been mentioned in discussing research were the most important threats to agriculture which developed during the growing season.

Trouble due to potato tuber moth has shown a considerable increase, especially in the Arcturus area. Some farmers have attributed this to development of resistance to DDT by this insect, but it is by no means certain that this has, in fact, occurred. Some cases were investigated and generally the failure seemed more likely to be due to faulty application of the insecticide. Damage by leaf-eating ladybirds, especially to solanaceous and cucurbitaceous plants, was more widespread than usual. Dieldrin was found to give good control and did not damage the foliage of cucumbers which, like other cucurbits, are susceptible to damage by many of the commonly used insecticides. Tobacco aphis caused more trouble than usual and there were some occurrences of tobacco white fly. There are indications that malathion, which is much safer to use, will be as effective in controlling these pests as is parathion. The increasing prevalence of citrus psylla noticed in recent years has been maintained.

Two attacks on plywood by boring beetles were recorded and, although the insects concerned were quite different, being a bostrychid in one case and the powder post beetle in the other, in each case the borers had evidently been repelled by the glue joining the laminae and had not bored through it. The powder post beetles had chosen rather to bore their way to the exterior through a coating of oil paint.

Forensic Entomology

There were two cases of deaths being caused to Africans by feeding on insects. One was in respect of blue blister beetles, *Cyanolytta subcoriacea*, the family of Meloidae to which they belong being well known as including insects containing the virulent poison cantharidin. The other was a peculiar case since the insect concerned, *Brachytrypes membranaceus*, the sand cricket, is a common article of food. It is surmised that the insects had not been cleaned before cooking and they contained undigested remains of some poisonous plant on which they had been feeding.

Advisory Service

There was a further increase in the number of inquiries recorded at the Branch which reached 758.

The general staff shortage again restricted the number of advisory visits which were made to farms and these totalled only 12. On the other hand greater liaison was maintained with Research Stations and Henderson, Grasslands, Gatooma, Sabi, Gwebi College and Inyanga were all visited, mostly several times, and also the Native Department Station at Makoholi.

Exhibits designed to stress the importance of the Khapra beetle were placed on the Salisbury and Bulawayo shows.

Eleven lectures were given, eight being to the students at Gwebi Agricultural College. A collection of colour slides illustrating insect pests and methods of their control is being built up and these have proved of great value for lecture purposes.

Publications

The following articles have been published in the *Rhodesia Agricultural Journal*:—

(1) Report of the Chief Entomologist for the Year Ending 30th September, 1954, by M. C. Mossop.

(2) Hessian and Stored Tobacco Pests, by J. A. Whellan.

(3) A Grain Pest new to Rhodesia, by J. A. Whellan.

(4) A new Insecticide which can be used in Army Worm Control, by J. A. Whellan.

(5) The Khapra Beetle in Rhodesia, by J. A. Whellan.

(6) Powder Post and other Wood Borer Beetles which are Pests of Timber in Rhodesia, by D. J. W. Rose.

Some more popular articles have also been published in the *Rhodesian Farmer*, *Rhodesian Tobacco Journal* and *Rhodesian Tobacco Quarterly*.

Visiting Entomologists

The following entomologists from other countries visited the Branch:—

Mr. E. C. G. Bedford, Division of Entomology, Pretoria, in connection with parasites of jacaranda scale insect.

Mr. G. A. Haswell, Assistant Colonial Liaison Officer from the Pest Infestation Laboratory, Slough.

Mr. E. O. Pearson, Assistant Director, Commonwealth Institute of Entomology, in connection with research on cotton pests.

Dr. K. Salmond, Entomologist of the Maize Control Board, Northern Rhodesia, in connection with stored grain pests.

Phytosanitary Services

The inspection fee for plant imports, which had become an anachronism, was abolished by Government Notice.

Several discussions with representatives of the Northern Rhodesian and Nyasaland Departments of Agriculture were held and an Interterritorial Phytosanitary Committee was set up, with the primary object of securing uniformity in phytosanitary and allied matters throughout the Federation. A bill with its dependent legislation to supersede the existing Plant Import Regulations, Tobacco Pest Prevention Regulations, Nursery Regulations, Cotton Pest Prevention Regulations of Southern Rhodesia and their equivalents in the northern territories has been drafted and is approaching its final form. Legal and political technicalities remain obstacles to its publication but it is hoped that they will be overcome in the near future.

The opportunity is also being taken to unify throughout the Federation the control of imports of bees, honey and bee-keeping equipment and to place the regulations for ease of administration by customs officers, under the Control of Goods Act. A large import of Australian honey was discovered, but too late to stop its distribution. The co-operation of the Australian Trade Commissioner in preventing recurrences of such illegal imports was secured. No legal action was taken as it was apparent that this importation was made in ignorance and no useful purpose would thus have been served.

The increase in the amount of plant material imported into the country continued but, with the discontinuance of the inspection fee, the compilation of returns at the minor ports of entry has ceased because the labour involved would not be justified by the value of the statistics obtained. The appointment of an additional Plant Inspector allowed refrigerated fruit from South Africa intended for Gwelo to be taken there before examination.

Altogether 784 Special Permits for the import of plants were issued and 47 nurseries in the Union of South Africa were issued with Annual Permits. Registered nurseries in Southern Rhodesia totalled 48 and again no serious pests were discovered in the course of inspections so that quarantine restrictions were not necessary. Certificates of cleanliness were issued following examination of 213 consignments of plants intended for export.

A consignment of tobacco samples imported from the United States of America was destroyed on arrival because it was found to be infested with cigarette beetle.

The number of Tobacco Removal Licences issued for 1956 increased by 219 to 3,558. In addition to this there are approximately 300 to 350 tobacco farms and premises in Northern Rhodesia. Largely due to the fact that for the first time six Inspectors were employed for the whole year the number of inspections made, 4,211, was higher than in any previous year. Of these inspections 360 were in Northern Rhodesia, one Inspector operating there for several months and completing inspections of all premises there. Two visits were made to Beira for the purpose of inspecting the tobacco storage sheds there.

Three successful prosecutions were made in terms of the Tobacco Pest Prevention Regulations, one for failure to destroy tobacco plants by the 1st July and two for failure to destroy unwanted seedbed plants.

In the course of inspections cigarette beetle was found ten times in warehouses and samplerooms. A light infestation was also found in one consignment of tobacco of the current season's crop on its arrival at a grading shed. In all cases appropriate action was taken and the pest was destroyed.

BOTANY AND PLANT PATHOLOGY

DR. G. R. BATES
Chief Botanist and Plant Pathologist

Introduction

A feature of the past year has been the increased demands made upon the services of professional officers of this Branch in connection with the local production of certified grass and vegetable seeds and with developments in the seed potato growing industry. These duties are both onerous and time consuming and naturally interfere with the advisory and research activities of the officers concerned. However, they have been freely provided in the absence of any organized inspection service within the Department since it is felt that every encouragement should be given to the successful establishment of these new and important developments. The time is rapidly approaching, however, when the question of a consolidated inspection service, embracing many crops and duties, may require serious consideration.

The provision of new laboratory equipment facilitated the work of the Seed Testing Section and it was thus possible to deal more expeditiously with the increased volume of samples received. It is disappointing to have to report yet again that no progress has been made to alleviate the problem of congestion and unsuitable buildings which continues to hamper the work of the Botany and Plant Pathology Sections.

Due to the extended secondment of the Senior Botanist to London for work on the Flora Zambesiaca project and the resignation of the grass taxonomist, the staff of the Botany section was reduced to one professional officer towards the end of the period under review. It is expected that this situation will soon be remedied by the arrival of a new taxonomic botanist.

Despite the interference caused by extraneous duties it has been possible to continue most of the major research projects on maize, potatoes, and legume crops. As before, we are indebted to the several Research Stations and to the Department of Conservation and Extension for valued assistance in conducting these investigations. The work on potato disease problems has been carried out with the close co-operation of the Chief Agriculturist and his staff.

Considerable travelling was done by all officers in connection with routine advisory work, inspection services and research projects. As in previous years, particular attention was given to many special problems found in the Eastern Districts. It is, indeed, quite certain that the range and economic importance of plant diseases occuring in this part of the country justify serious consideration being given to the possibility of stationing a plant pathologist permanently in this region.

Several talks were given to Farmer's Associations and to other organizations concerned with agriculture and horticulture. Members of the staff judged at five agricultural shows in the course of the year, whilst the Branch also prepared exhibits for the Bulawayo and Salisbury shows. The usual short course of plant pathology lectures was delivered to students at the Gwebi College of Agriculture and supplemented this time by two additional lectures on seed potato production and weed control respectively.

Four papers appeared in the "Rhodesia Agricultural Journal" and two in other scientific journals. Articles, notes and reviews were contributed to the "Rhodesian Farmer" and other publications including the local Press.

Botany

Herbarium. Taking into account the fact that the Exell, Mendonça and Wild expedition accounted for more than 1,500 of the 7,196 specimens recorded last year, the figure of 6,033 specimens entered during the past twelve months represents an even better regular intake than in any previous year.

3,298 plants were named for Government Departments mainly in Southern Rhodesia, the principal users of this service being Native Agriculture, Pasture Research, Tsetse Fly Operations, Entomology, Conservation and Extension and the Southern Rhodesia Forestry Commission. Numerous determinations were also made on behalf of Departments in Northern Rhodesia and Nyasaland.

Intensive collecting expeditions were undertaken in the Wankie Game Reserve; on the slopes of Mt. Pene and around the Lusitu-Haroni junction in the Melsetter district; in Nuanetsi close to the border of Portuguese East Africa, and in the hilly parts of the Enterprise and Arcturus districts near Salisbury. Much new material of considerable botanical interest was obtained from these expeditions.

Useful collections were also made by private individuals, notable contributions being received from Dr. W. Gilges, Mr. N. C. Chase, and Major O. B. Miller. In addition to his regular contributions Mr. Chase, through the agency of the Government Herbarium, kindly presented to the British Museum his complete set of duplicates, amounting to more than 6,000 specimens, of his magnificent collection of Eastern District plants. This splendid gesture is much appreciated and will greatly assist in the preparation of the Flora Zambesiaca.

As a natural consequence of our increased activities in connection with the new flora there has been an accelerated interchange of specimens with other Herbaria and specialists all over the world, more particularly in England and other European countries. More than 20,000 specimens were despatched or received in the course of the year and the work involved in listing, recording and packing this material occupied an appreciable amount of the time of the staff. Agreement was reached regarding the detailed arrangements involved in placing the Flora Zambesiaca project on an active footing. It was then possible for the Senior Botanist to procede to London at the beginning of July on extended secondment to Kew and the British Museum to work exclusively on this important project. Considerable progress has already been made in dealing with the 27 families to be included in the first volume of the new Flora. The *Ranunculaceae* has already been written up and work is well advanced on the *Polygalaceae* and *Tiliaceae*. When this volume is completed which, it is hoped, will be within the next eighteen months, it is planned to produce the *Leguminosae* and *Gramineae* in view of their direct economic importance to the agricultural development of the Federation.

The final part of "A Revised List of Grasses of Southern Rhodesia" containing the bibliography, glossary and indexes, was published during the present year. This useful work has been widely welcomed and has undoubtedly filled the need of field workers for a standard reference book on local grasses.

Many visitors were welcomed to the Herbarium in the course of the year some of whom spent varying periods working through our collections. Special mention must be made of the valued assistance received from Mr. F. C. Greatrex who kindly continued to name all the orchid material received.

Economic Botany. Eleven cases of suspected plant poisoning in animals and humans were reported on for the Police, Government Analyst, and the Veterinary Department. A survey was made of the species of *Crotalaria* occurring in the Chipinga district following the occurrence of suspected crotalariosis amongst cattle in the area. *Crotalaria gazensis* was the only species found to have been heavily grazed and a feeding trial with this species was therefore advised to the Veterinary Department on whose behalf this investigation was made.

Numerous plants used in native herbal remedies were named, mainly for Dr. M. Gelfand in connection with his special study of this subject. Advise was given on the possibilities of *Rauvolfia* production and on the large scale collection of *Dioscorea* species for commercial pharmaceutical purposes.

Many inquiries from farmers and Extension Officers regarding the potential value of specimens of grasses and legumes were dealt with. The volume of such inquiries reflects the keen interest and attention now being paid towards the development of permanent pastures suited to the varied climatic and soil conditions obtaining in this country.

With the improved facilities and staff available, satisfactory control was maintained over the water hyacinth infestation in Lake McIlwaine and the Makabusi River using an amine salt of 2, 4-D applied at the rate of 2 lb. acid equivalent per acre. Because of the dense growth of reeds and grasses in many swampy parts of the lakeside together with seedling re-growth in the river it has not been possible to achieve any measure of eradication in the case of this original infestation. The new outbreak at Maria's Home Farm near Beatrice was also treated with 2, 4-D. Subsequent inspections indicated that there is no immediate danger of any extensive spread of the weed from this source. Four separate occurrences of water hyacinth were located in the Tsungwesi and Odzi I.C.A. districts. Vigorous action was continued against these infestations in conjunction with officers of the Department of Conservation and Extension.

Constant vigilance by the Plant Inspectors of the Entomology Branch resulted in no less than four interceptions of living water hyacinth plants being made during the year.

Information regarding our local campaigns against water hyacinth was supplied to the Commission for Technical Co-operation in Africa south of the Sahara which is seeking to organize concerted action to prevent the spread of this pest throughout the territories of its member Governments.

Discussions took place with other Government Departments regarding the possible declaration of *Lantana camara* as a noxious weed in certain regions of the Eastern Districts. Legal and administrative problems, consequent upon Federation, as regards the operation of the Noxious Weeds Act have also been raised and are being more closely studied by the appropriate authorities.

Requests for determinations and advice on the control of weeds were again received from many farmers and gardeners. Chemical methods for such control are becoming more popular as the newer weedkilling materials become more readily available. In the absence of a specialist officer on weed problems we are forced to rely very largely on the technical officers attached to commercial firms supplying weedkillers for up-to-date advice and recommendations regarding the usage of these materials.

National Botanic Garden. Work continued on a care and maintenance basis only. It is, however, pleasing to report that provision has been made for the early appointment of a Garden Superintendent together with funds for the essential preliminary work in connection with the proper development of this important amenity to the cultural life of the country.

Officers of the Botany Section paid regular visits to the Ewanrigg Aloe and Cycad Garden in their capacity as professional advisors to this unique botanical display.

Plant Pathology

Advisory. Although the 1955-56 rainy season was a satisfactory one in the sense that the total rainfall was adequate, the month of January was unusually dry and as a result the development of certain serious crop diseases, notable leaf blight of maize, was appreciably checked. Late rains were again experienced in many districts and were associated with a heavier incidence of *Diplodia* cob rot of maize than usual and with a severe but localized epiphytotic of late blight amongst potatoes planted during February-March.

747 specimens were received and included 35 new host and disease records of which the following justify special mention:—

Bacterial spot, black dot, and wilt of tomato due respectively to *Xanthomonas vesicatoria* (Dowson) Gardner and Kendrick, *Colletotrichum atramentarium* (Berk. and Br.) Taubenh., and *Verticillium dahliae* Kleb.; grey mould of tobacco, chocolate spot of broad bean, and stem blight of groundnut, all caused by *Botrytis cinerea Pers.*; cottony leak and scab of cucumber due to *Pythium aphanidermatum* (Edson) Fitzpatr.; and *Cladosporium cucumerinum* Ell. and Arth., respectively; leaf spot of dhal (pigeon pea) due to *Cercospora cajani* P. Henn; white blister rot of turnips due to *Cystopus candidus* (Pers.) de Bary; downy mildew of cauliflower due to *Perenospora parasitica* (Fr.) Tul.; leaf ring spot of red clover due to *Stemphyllium sarcinaeforme* (Cav.) Wilt.; leaf spot of bougainvillea and bacterial wilt of Russian comfrey (*Symphytum peregrinum*) both caused by *Pseudomonas solanacearum* (Smith) Dowson; bacterial stalk rot of maize due to *Bacterium carotovorum* (L. R. Jones) Lehm. and Neum. (=*Erwinia carotovora* (Jones) Holland); and tobacco rosette virus attacking *Nicotiana rustica.*

Tobacco. More tobacco specimens and inquiries were received and dealt with than in the case of any other crop. Tobacco anthracnose (*Colletotrichum tabacum*) although extending its range to several new districts did not develop so extensively or severely as might have been anticipated. Whether this fairly satisfactory state of affairs can be ascribed to climatic conditions, the careful handling of sedbeds or to other reasons is difficult to say. Many growers took the precaution of applying protective Zineb sprays in addition to other routine fungicidal treatments. The widespread distribution of anthracnose warrants every care being taken by growers against any sudden flare-up up this potentially serious disease. Wildfire was prevalent in many districts during November and December but, like many other diseases, was checked by the dry spell in January. Fewer cases of angular spot were reported than in the previous year. Barn rot (*Rhizopus arrhizus*) caused more trouble than usual especially amongst early curings. Very little white mould was reported for the second successive season.

The mild, atypical form of tobacco rosette was again recorded from numerous tobacco growing districts, the same virus disease being observed for the first time affecting *Nicotiana rustica.* Leaf spotting, ascribed to nitrogen-phosphate unbalance, appeared to be less prevalent than in previous seasons. Leaf blotch of seedlings, due to *Septomyxa affinis*, was recorded after a lapse of several years. Numerous specimens of frog-eye and *Alternaria* were submitted but no reports of serious losses from these leaf spotting diseases were received.

Potato. The summer crop was again seriously damaged by late blight which, though checked by the long dry spell during January, caused substantial losses to growers. A disquieting feature of the period under review was the rapid breakdown of resistance in both the so-called resistant varieties "Pentland Ace" and "Kennebec". The former, widely planted as a summer crop, rapidly succumbed to race (3, 4) of the pathogen. In fact, it was attacked more readily than the comparatively susceptible Up-to-Date variety. "Kennebec" whilst standing up reasonably well to late blight in summer plantings was severely attacked in subsequent early irrigation crops grown in the Enterprize district due to the development of race (1, 3, 4) of the fungus. Based on this experience the outlook for resistant varieties derived from *Solanum demissum* is not encouraging. On the other hand, several varieties of Dutch origin, which possess field resistance to late blight, have performed consistenly well as regards yields under severe blight attack for the past two years. The wider use of such varieties coupled with adjustments in the planting time of susceptible varieties in order to avoid dangerous blight periods seems to offer most promise in overcoming this important problem.

Only one case of blackleg (*Erwinia atroseptica*) was recorded in an irrigated crop grown from imported seed. It is interesting to note that no authentic instance of this disease has yet been discovered in potatoes grown from locally produced seed.

Bacterial wilt (*Pseudomonas solanacearum*) was common in the Eastern Districts and also caused losses amongst irrigation crops.

Seed Potato Schemes. Officers from the Branch undertook most of the field inspections required for the Eastern Districts scheme. Mainly because of bacterial wilt only four out of the eighteen crops registered under the scheme were approved. The prevalence of this disease constitutes a serious obstacle towards the establishment of a seed potato association in this region. Despite these set-backs growers are continuing to search for wilt-free land suitable for seed potato production.

Following discussions with growers of the Salisbury Potato Pool another scheme was initiated during the year aimed at improving the quality and uniformity of locally grown potatoes offered for sale for seed purposes. The regulations for this new scheme were largely drafted by officers of this Branch who have also conducted the numerous field inspections involved in its operation. This second scheme was initiated at the request of local potato growers and its objectives are quite distinct from those of the Eastern Districts project, which it should be explained, is designed to develop into an organization for producing high-grade, certified seed potatoes. At the moment, the Salisbury scheme is largely exploratory and much will depend upon the outcome of the crops now registered for this purpose.

Maize. After three successive seasons of heavy attack by leaf blight (*Helminthosporium turcicum*) throughout the principal maize growing districts there was a marked reduction in the general intensity of this important disease during the season under review. It seems probable that this may be accounted for by the long dry spell in January which served to check the spread and development of the disease at a critical stage in the growth of the crop.

Very little tropical rust (*Puccinia polysora*) was reported and its general incidence, as determined by a country-wide survey, was far lower than in previous seasons. The disease also appeared much later than usual.

Dry rot of cobs caused by *Diplodia zeae* was particularly prevalent. A gradual build-up of this important disease has been noted over the past three years. Late rains, which in many districts, continued into June probably contributed towards the increased incidence of the dry rot stage in the cob. Several cases of either paralysis or death of cattle were associated with the occurrence of Diplodia dry rot in maize lands used for grazing. The danger of poisoning under such circumstances was aggravated by the practice adopted by some farmers of discarding diseased maize cobs in the the field during harvesting.

Maize leaf spot and ear rot caused by *Diplodia macrospora* were again recorded; two localized outbreaks of the latter phase of the disease being reported from Umtali and Sipolilo respectively. No untoward development of this new disease was observed.

Two unusual diseases of maize, both associated with bacterial infection, were observed for the first time. The more potentially serious of these was found attacking irrigated hybrid maize at Umvumvumu in the Sabi valley. The general symptoms correspond very closely with those of a bacterial stalk rot of maize reported from the southern states of the U.S.A. and Egypt where it is associated with high temperatures. A bacterium, identified as *Bacterium carotovorum* was regularly isolated from the disorganized pith at the base of the stalk of affected plants and the disease successfully reproduced by inoculating maize plants with suspensions of the bacterium.

The second disease was noted affecting one particular line of inbred maize, receiving spray irrigation, at the Henderson Research Station. Infected plants showed a characteristic rotting of the growing point. Several bacteria were isolated but none proved actively pathogenic in artificial inoculations.

Streak virus and downy mildew (*Sclerospora sorghi*) were again found in maize crops in the Eastern Districts low veld, neither disease was as severe as in the previous season.

Forage and Green Manure Crops. A bacterial leaf spot of velvet bean due to *Pseudomonas syringae* developed for the second successive year on the Salisbury Experiment Station where it caused some damage to young plants. The same disease also attacked velvet beans on several farms and was recorded as far afield as the Matopos Research Station. Fortunately, the dry weather in January seemed to check its severity and most affected crops grew out satisfactorily. Circumstantial evidence points to this bacterial disease being seed-borne. Stem and vine rot of velvet bean caused by *Phytophthora dreschleri* was found to be widespread in the Gatooma district where it appears to have been established for some time. It was also recorded for the first time from Enterprise and Gwebi.

Very few cases of stem-break in sunnhemp were reported for the second successive year.

Serious damage to cowpea crops in many districts was caused by a leaf spotting disease recently identified as being due to a species of *Ascochyta* near *A. phaseolorum* Sacc. The disease is responsible for severe defoliation. No evidence of resistance has been found in any of the locally grown varieties. Investigations have shown that the disease is seed-borne and the infection sufficiently deep seated to be unaffected by fungicidal seed dressings. Measures for controlling this important disease will therefore depend, in the first instance, upon the use of disease-free seed. Another zonate leaf spot of cowpea has also been recognized but owing to the absence of identifiable fructifications and spores in all the specimens examined the exact cause of this disease is still uncertain.

Numerous specimens of diseased lucerne plants were received from many parts of the country. Rust due to *Uromyces striatus* was recorded from Midlands districts; *Pseudoplea trifolii* caused a leaf spot on samples from Salisbury whilst collections from several districts including Melsetter and Karoi were affected by a leaf spot due to *Pseudopeziza medicaginis.*

Red clover was severely damaged by a leaf spot disease dut to *Stemphylium sarcinaeforme* which had not previously been encountered in Southern Rhodesia.

Experimental plantings of *Crotalaria intermedia,* a promising new green manure crop, were affected by a leaf spotting disease caused by a species of *Septoria.*

Ergots were far less prevalent on veld grasses and small grain crops than in the previous season. In fact, some difficulty was experienced in obtaining samples of ergot infected grain from native grown munga crops required for further pharmacological study overseas.

Vegetables. Tomato plantings in the Eastern Districts were again affected by bacterial wilt and leaf mould (*Cladosporium fulvum*); the latter disease was also recorded on tomatoes grown under glass in Salisbury. Indications that late blight (*Phytophthora infestans*) is likely to become a series menace to the production of tomatoes were evidenced by the discovery of the disease attacking the foliage of crops grown at Melsetter, Umtali and Salisbury. At least two races of the fungus adapted to tomato have been recognized amongst the material so far examined. *Verticillium dahliae* was responsible for wilt of tomatoes growing under glass and was also associated with wilt symptoms in eggplant and okra in local gardens. An outbreak of buck-eye rot (*Phytophthora parasitica*) occurred on tomato fruits from an irrigated crop in the Sabi Valley.

Black rot (*Xanthomonas campestris*) was prevalent on cabbages and cauliflowers especially amongst crops grown under irrigation. Fusarium wilt of field peas occurred in several plantings in the Eastern districts. Both powdery and downy mildew were noted on this host in the same region. Chocolate spot (*Botrytis cinerea*) was discovered for the first time attacking broad beans. Several cases of broad bean rust (*Uromyces fabae*) were also recorded. Scab due to *Elsinoe* sp. again caused losses in field crops of French beans although the incidence of this and other diseases amongst extensive commercial plantings of beans was lower than in previous years.

Fruit. Bitter rot (*Glomerella cingulata*) caused heavy damage to apple crops in the wetter parts of the Eastern districts, certain varieties appear particularly susceptible to the disease. Mildew was again widely reported on mango, peach, and apple trees. Severe defoliation due to rust (*Puccinia-pruni-spinosae*) occurred in many peach orchards.

Further interceptions of citrus black spot (*Guignardia citricarpa*) on South African oranges and lemons were made through the vigilance of the Plant Inspector stationed at Bulawayo. The frequently reported disorder known as concentric ring blotch of citrus is now ascribed to the activities of a small mite and may be checked by regular applications of lime-sulphur or other miticide preparations.

Flowers. Severe injury to antirrhinums grown for seed production was caused by *Phytophthora parasitica.* Numerous cases of antirrhinum rust were also reported especially amongst plants grown during the spring and early summer months. More dahlias infected with Kromnek (tomato spotted wilt) virus were detected and destroyed in the course of routine inspections of plants grown from tubers imported under special permit than for many years past. In all cases the infected tubers were traced to the same supplier in Holland. Representations on this matter were made through official channels to the Netherlands authorities concerned with plant exports whilst measures were taken to prevent any further introduction of infected tubers from this source.

Lawn turf. Many outbreaks of slime mould, *Physarum didermoides,* developed during the early part of the rainy season on lawns dressed with compost or tobacco scrap. This slime mould is quite harmless to the turf but its unusual and rapid appearance worries gardeners who believe they are confronted with a new and dangerous disease problem. The season under review was particularly favourable for the development of slime moulds, several new records being obtained from tobacco seedbeds and from strawberry plantings following the increasing use of grass mulches on such crops.

Research

Maize. Work was continued on the testing of varieties for their behaviour towards leaf blight. Seasonal conditions were unfavourable for the natural development of the disease but useful information was obtained from the variety resistance trials which were regularly inoculated with *Helminthosporium turcicum.* Several lines of both white and yellow types obtained from Natal and the U.S.A. together with some local inbreds exhibited promising resistance. Both Zineb and Captan satisfactorily controlled leaf blight in experiments designed to ascertain the yield loss due to this important disease. All plots were inoculated with *H. turcicum* at weekly intervals until tasselling. The yield of plots protected by these fungicides averaged 32 per cent. more than the controls which is much the same result as was obtained in previous trials. Despite the comparatively low incidence of natural infection by *H. turcicum* it is interesting to note that a slightly higher infection rating was recorded throughout the inoculated control plots of the present experiments than was the case in the 1954-55 series. This not only points to the efficiency of the inoculation technique used but also suggests that the generally low level of natural infection during the season under review was due to the absence of *H. turcicum* spores during a critical period in the growth of the crop.

A large-scale experiment was laid out at the Gatooma Research Station to compare the effects of stubble mulching and of ploughing under the normal trash cover from a previous crop with clean cultivation on the development of leaf blight. Sub-treatments included two levels of nitrogenous

fertilizer to all main treatments. Although a higher incidence of the disease developed throughout the stubble mulched plots after the first six weeks no appreciable difference between treatments could be detected at tasselling. This is ascribed to secondary spread of the disease and its generally low incidence due to unfavourable weather conditions.

Investigations on tropical rust (*Puccinia polysora*) were restricted to a further yield loss trial using protective fungicides. Owing to the late appearance and low incidence of the disease no obvious differences in yield were obtained. Studies on varietal resistance to tropical rust were confied to the assessment of locally selected inbreds at the Sabi Valley Experiment Station where, because of the low intensity of the disease, it was not possible to obtain any reliable estimates.

Potato. In continued trials at the Salisbury Experiment Station with late blight resistant varieties, "Pentland Ace" succumbed very rapidly to race (3, 4) of *Phytophthora infestans*. Several newly introduced varieties from Holland in addition to the four previously tested showed good field resistance to the disease. Tubers from more than 300 seedlings bred by Dr. J. E. van der Plank, of the Department of Agriculture, Pretoria, were also tested for blight resistance and general suitability under local conditions. 65 of these genotypes were retained for further field testing and to determine the storage qualities of the tubers.

The possibility of overcoming the late blight problem in summer crop potatoes by adjusting the time of planting to avoid the main blight period is being explored by a series of experiments in widely separated regions of the country. The onset of late blight and its progress will be recorded in conjunction with detailed information regarding meterological conditions at each site.

Work was continued in collaboration with the Plant Pathology Station, Corstophine, Scotland on the transmission and control of potato blackleg (*Erwinia atrosephtica*). The extremely low incidence of the disease throughout the experimental material received from overseas this year prevented any satisfactory conclusions being derived from the experiments which included the use of a combined mercury-phenol dip and treatment with an antibiotic "Agrimycin". Attempts to recover the blackleg organism from soil samples taken from areas where the disease developed in plants grown from imported tubers several months earlier were uniformly unsuccessful. This observation, coupled with the complete absence of blackleg in all experiments in which locally produced tubers have been used tends to reinforce our opinion that the disease is unable to persist for any appreciable time in local soils.

Sunnhemp. In continued investigations on stem-break disease caused by *Colletotrichum curvatum* twelve species of *Crotalaria* were found to be immune to all seven isolates of the fungus used for inoculation. The disease did not persist after two years in infected sunnhemp trash buried to a depth of between two and four inches. On the other hand some infection was retained by similar trash left on the surface for the same period. Based on these findings it is now recommended that three rainy seasons should be allowed to elapse before planting sunnhemp again on previously infected land.

Velvet bean. Stem and vine rot caused by *Phytophthora dreschleri* is largely confied to poorly drained or low lying land. Recent investigations indicate that the disease may be seedborne either by infected pod debris mixed with the seed or through actual infection of the seed itself.

French bean. Extensive studies were made on the etiology and control of French bean scab due to a species of *Elsinoe*. Numerous cross-inoculations using a wide range of *Phaseolus* species and other related legumes have established that, despite its close morphological resemblance to *Elsinoe lunatus*, the fungus attacking French bean in this country is probably a new and undescribed species of *Elsinoe*. No evidence of true seed transmission was obtained although it is possible that the disease might be disseminated through the presence of infected seedpod trash. Only young, expanding leaves were susceptible to scab infection in the greenhouse, green pods remained susceptible until the harvesting stage. A proportion of apparently healthy pods collected from a diseased crop developed typical scab lesions after two days storage. Screening tests were made with several fungicides both in the greenhouse and field. Good control was obtained with the following schedule:—(a) before flowering, 4:6:50 Bordeaux mixture; (b) from early pod set, Thiram (T.M.T.D.) or Captan at 2 lb. per 100 gallons water.

Deciduous Fruit. Considerable attention was given to the bitter rot problem which constitutes a serious obstacle to the successful commercial production of apples in the wetter parts of the Eastern Districts.

Two methods for controlling bitter rot are being actively investigated. Firstly, the use of eradicant fungicides such as organic mercurials and sodium pentachlorphenate applied as dormant sprays and secondly, the use of protective cover sprays applied during the growing season. Because of the phytotoxicity of Bordeaux mixture and other copper fungicides to apples, cover sprays of the more inert organic fungicides are being used in carefully planned schedules.

General. Many other lines of investigations were continued on a range of plant disease problems. These included a study of the host relationships of various strains of the bacterial wilt organism, *Pseudomonas solanacearum*, and experiments designed to examine the possibility of introducing this disease into heavier soils through the agency of infected potato tubers. The outcome of this latter work may have an important bearing upon the successful development of the Eastern

Districts seed potato scheme. Much attention was given to the testing of various fungicides against important diseases of vegetables and other crops. In this connection, copper fungicides, particularly Bordeaux mixture, gave better control of *Alternaria* leaf blight of carrots than Zineb or Captan whereas Zineb and copper oxychloride proved most suitable against *Septoria* leaf blight of tomato. A mild attack of leaf spot of groundnut due to *Cercospora arachidicola* was satisfactorily controlled by both cuprous oxide and sulphur dust. The former fungicide was somewhat phytotoxic but, surprisingly enough, tended to increase yields even in cases where practically no leaf spot developed in the controls.

Seed Testing

Interest in the potentialities of the Federation for producing crop, vegetable and flower seeds on a substantial scale continues to be shown by the overseas seed trade, especially in the United Kingdom. The possibilities of this new industry are also attracting increasing attention from farmers in many districts judged by the number of inquiries received on the subject. Talks on various aspects of seed production were given to four Farmer's Associations in Mashonaland. During his visit to Europe in June, 1956, to attend the International Seed Testing Conference in Paris, the Officer-in-Charge, Seed Services, was able to discuss the prospects of seed production in the Federation with several commercial concerns. In addition to visiting seed producing centres in both France and England he also called on research institutions concerned with seed testing problems.

Demands upon the facilities of this Section for advice and inspection services arising from these developments have been so numerous that it has been difficult to satisfy all the requests without serious interference to the research programme.

Laboratory. The 1,166 samples received for testing represented a small increase over last year's figure. 13.9 per cent. of all samples failed to satisfy the required minimum standards. 2,939 germination tests were made, this number includes both routine and research tests. Numerous samples were also dealt with for identification, disease examination, hard seed treatment and the presence of weed seed contaminants.

Maize provided the largest proportion of the samples submitted, closely followed by vegetables, grasses and legumes in that order.

The mean percentage germination of maize samples examined on behalf of the Seed Maize Association was 97.8 as compared with 95.5 in the case of non-certified samples. The general level of maize seed infection by *Diplodia zeae* and *Fusarium graminearum* was slightly higher than in the previous year thus reflecting the gradual build-up of these important diseases in seasons where the rainfall is both heavy and prolonged. More *Diplodia zeae* was recorded in seed from open pollinated varieties than from hybrid types.

Difficulties were encountered in overcoming the hard seed problem in *Crotalaria intermedia* by the use of sulphuric acid due to the hazards in applying this treatment on any scale. Other methods for dealing with hard seed in this crop are therefore being studied.

The quality and uniformity of certified pasture seed produced by the Rhodesia Pasture Seed Growers' Association showed a pleasing improvement. There was a marked reduction in the weed seed content of the samples tested whilst improved production methods have led to much better overall yields. Many growers exceeded 100 lb. seed per acre in the case of Katambora and Giant Rhodes grasses, one grower obtaining an average yield of more than 200 lb. per acre from 20 acres. No less than 55 applications for crop inspections involving 575 acres were dealt with on behalf of the Association. 17 acres of lettuce, 4 acres of tomato and 8 acres of bush and runner beans were also inspected for seed production purposes.

Legislation. 210 samples, mainly of vegetable seeds, were drawn from agents and merchants in the principal towns. 85 of these were rejected as being below standard and a further 17 were found to be improperly marked. Where official warnings were ignored steps were taken to confiscate substandard vegetable seeds exposed for sale to the public. One approved seed testing laboratory in Salisbury closed down during the year, periodic visits were made to the remaining three laboratories.

Research. A survey of diseased maize ears collected from many areas of Southern Rhodesia showed that the more important ear rotting pathogens are generally distributed. Some interesting new records of ear rotting fungi were obtained in the course of this work, fortunately none of them appear to be of any serious consequence.

Representative maize inbreds, hybrids and open pollinated varieties were again tested for their behaviour towards the major cob rotting diseases. Although no spectacular resistance against these diseases has yet been discovered this work serves a useful purpose by providing the maize breeders with practical information regarding the resistance available in local inbred strains and the stability of such resistance when introduced into new hybrids. Further refinements and improvements were made in the techniques employed in this work. A satisfactory method of inoculation has been developed whilst these latest investigations have also demonstrated the importance of the correct timing of field inoculations. Several methods for assessing the amount of ear rotting were compared, the most accurate and reliable was by means of grain counts.

The stubble mulch trial at Gatooma, referred to earlier in this report, was also examined in respect of the development of ear rotting diseases. Rotting caused by *Diplodia zeae* and *Fusarium graminearum* was more prevalent on the stubble mulched plots than on the trashed plots, the latter in turn showing more infection than the clean cultivated plots. On the other hand, the incidence of both these types of rot tended to decrease with increasing levels of nitrogen. Development of *Fusarium moniliforme* rot was not affected by any of the treatments but showed a close relationship with the amount of insect damage.

The practical importance of *F. moniliforme* as a disease of maize has for long been a controversial matter. Local investigations on this subject indicate that grain infection by this pathogen may reduce germination and therefore emergence but has no appreciable effect on yield. This work has also shown that fungicidal seed dressings are only beneficial where the seed carries a light infection of *F. moniliforme*. Heavily infected seed does not respond to fungicidal dressings.

Problems arising from the improper application of seed dressing were investigated. Non-mercurial preparations such as Fernasan (T.M.T.D.) were found to be more satisfactory than the mercurials Agrosan and Harvesan for treating chipped maize grain especially when the grain was exposed to difficult growing conditions after planting. Seed maize overdressed with organic mercury preparations showed a serious decline in germinating capacity when stored from one season to the next. On the other hand, maize seed properly dressed with such preparations retained its viability just as well as untreated seed for periods of 2-3 years provided the moisture content of the grain was less than 12.5 per cent.

Work was continued on the development of suitable seed testing methods for use with important subtropical pasture grasses. Satisfactory techniques have been established for various strains of Rhodes grass, Bambatsi Panicum and Weeping Love grass.

In field trials to compare the performance of white haricot canning beans under local conditions rust infection proved to be a limiting factor in summer crops. The variety California Small White was outstandingly the best in these trials.

Field trials were also conducted with acid delinted and machine delinted cotton seed using a range of 16 seed dressing preparations. Irrespective of the seed dressing treatment used emergence was always quicker and better in the case of acid delinted seed. None of the dressings used showed any marked superiority, all tended to improve both stand and seedling quality.

Miscellaneous

The Branch was represented on several Departmental and other committees including the Salisbury Potato Association and the Rhodesia Pasture Seed Growers Association. The Chief Botanist and Plant Pathologist continued to act as Liaison Officer for the Federation for the Commonwealth Agricultural Bureaux organization and as a member of the Federal Scientific Consultative Committee. He was elected an alternate member of the Scientific Council for Africa and attended the 1956 meeting of this body, held at Yangambi, Belgian Congo in July. The expanding activities of the Scientific Council (C.S.A.) and its associated organization, the Committee for Technical Co-operation in Africa (C.C.T.A.), requre an increasing amount of attention in connection with scientific and technical matters affecting the Federation.

REPORT OF THE DEPARTMENT OF CONSERVATION AND EXTENSION FOR THE YEAR ENDED 30th SEPTEMBER, 1956

In terms of the Northern Rhodesian Non-African Agriculture (Transfer to the Concurrent List) Ordinance, 1955, Non-African Agriculture in Northern Rhodesia became a Federal responsibility on the 1st January, 1956, and this Department became responsible for the organization and supervision of all Conservation and Extension Services in that Territory.

Insofar as Southern Rhodesia and Northern Rhodesia are concerned, this report covers the periods 1st October, 1955, to 30th September, 1956, and 1st January, 1956, to 30th September, 1956, respectively.

SOUTHERN RHODESIA

1. ORGANIZATION

The year under review was a particularly difficult one for the Department. Not only was it necessary to transfer a number of experienced staff to Northern Rhodesia but the unsatisfactory grading structure of the Department caused an abnormally high percentage of both senior and junior officers to resign from the Service. As a result of this it became impossible to give farmers and I.C.A. Committees the necessary assistance and guidance so that progress in general was not as good as had been expected. Fortunately the Interim Public Service Commission carried out, as a matter of urgency, a survey of the Department, following which improved conditions for field staff were introduced. It is now confidently expected that the staff position will show a considerable improvement during the coming year.

(a) Head Office

Due to the transfer on promotion of the Senior Executive Officer and within months his successor, the administrative work suffered considerably. In the junior administrative grades too, several changes were necessary due to resignations and transfers, while in the Records Office, changes in personnel affected efficiency.

On the professional side, the Department unfortunately lost its Chief Conservation Engineer as well as the two engineers in charge of Farm Machinery and Farm Buildings Advisory work.

A post of Senior Planning Officer was authorized and filled. This has strengthened the organization considerably and will ensure sound guidance and planning, particularly in the field of land-use development.

Professional assistance to the Director and Assistant Director at Head Office is urgently required to enable them to visit field staff more often and meet I.C.A. Committees and farmers in their areas. This is essential if the I.C.A. Committee organization and field work is to be carried out with enthusiasm and determination. Senior Officers must keep in close touch with the work in the field.

(b) Regional Offices

During the year, full time male clerical assistance was provided at Regional Offices. This has proved of great assistance.

At several Group headquarters, clerical assistance was made available on a part-time basis. This proved of considerable assistance but full time help should be made available as soon as possible to relieve professional and technical staff of elementary office routine work.

The serious shortage of field officers, referred to previously, placed a heavy extra burden on Regional and Group Officers.

(c) Intensive Conservation Areas

With the intensification of agriculture and the alienation of additional Crown Land, it is constantly necessary to consider the revision of boundaries and subdivision of existing I.C.A.s.

The present position in regard to I.C.A.s in the country is as follows:—

(i) Declared during the year: Gwaai, Matetsi, Ruwa.

(ii) Investigated or under investigation for declaration: The whole of the existing European farming area is now proclaimed and only new areas such as those under consideration for subdivision and alienation will have to be brought into existing I.C.A.s, or declared as separate units once these are occupied.

(iii) Subdivided during the year: Bromley, Marandellas North, Sabi Catchment, Wenimbi-Ruzawi.

These areas were subdivided into six I.C.A.s as follows: Bromley, Marandellas North, Marandellas South, Marandellas West, Wedza, Wenimbi.

(iv) Investigated or under investigation for subdivision: Darwin, Selous, Umvukwes.

(v) Boundaries changed: Angwa North, Angwa South, Battlefields, Beatrice, Bembezaan, Bubi, Chatsworth, Enkeldoorn, Essexvale, Featherstone, Gwelo, Gwelo East, Gutu, Inyanga, Inyati, Limpopo, Mayo, Melsetter, Nuanetsi-Mtilikwe, Selukwe, Tokwe, Umshandige, Umtali South, Umvuma.

(vi) Investigated or under investigation for boundary changes: Banket, Bromley, Cashel, Chipinga, Darwendale, Gwebi-Hunyani, Marodzi-Tatagura, Melsetter, Odzi, Ruwa, Salisbury West, Tsungwesi.

(vii) Areas declared: A total of 90 I.C.A.s have now been declared in Southern Rhodesia.

(d) **I.C.A. Committees**

Due to the serious shortage of staff, it was not possible to give as much assistance to all Committees as in the past. As a result, some Committees felt frustrated and tended to lose interest. Although this was most unfortunate, it is confidently expected that interest will be renewed in the near future as soon as the staff position is rectified. In most areas Committees operated actively and gave freely of their time for the cause of conservation. Their assistance was valued and although in a few cases not spectacular, nevertheless greatly appreciated for it contributed in a very substantial measure to whatever was achieved during the year.

Visits to farms in their areas as well as inspection flights were organized regularly by many Committees and must be commended as amongst the most important features of their work. In addition, Committees were most active in assisting with the organization of small field days which were of great value to the local communities. In many areas, too, they paid particular attention to Native cultivation and with the co-operation of the landowners, and in many cases the Native Department, considerable improvement in the position resulted.

Only in isolated cases was it necessary for Committees to recommend the issuing of Orders on local farmers by the Natural Resources Board. It is pleasing to report that in quite a few cases it was possible for Committees to recommend the withdrawal of Orders previously issued, as the landowners concerned had carried out the desired conservation works and improved their conservation practices satisfactorily.

Generally Committees held meetings regularly and programmes of work as well as problems were fully discussed and planned action decided on with the Conservation Officer.

(e) **Group Organization**

The Group organization improved considerably during the year and, with isolated exceptions, regular meetings, generally once a quarter, were held. In many instances, the meetings were combined with visits to farms within the Group. This stimulated tremendous interest. The various Group Chairmen were most active and devoted a very considerable amount of time to the organization of their Groups in order to bring about co-ordinated development. They also gave valuable assistance to individual Committees within their Groups, as well as to the staff of the Department.

2. STAFF

(a) **Establishment**

As already indicated, the staff position was most difficult during the year. Not only did a number of the most experienced officers leave the Service, but some had to be transferred to Northern Rhodesia, following the Federalization of non-African Agriculture in Northern Rhodesia, as from the 1st January, 1956.

Recruitment was also most difficult and arrangements were made for the Director to visit the United Kingdom for this purpose. The visit was on the whole successful. In addition, visits were also made to Universities and Agricultural Colleges in the Union of South Africa and a small number of recruits may be drawn from there. With the assistance of the Netherlands Immigration Office, several recruits were obtained from the Netherlands.

It will be appreciated that although all vacancies will probably be filled by the end of the year, the new officers will require training and it will be some time before they will be able to assume full responsibility for the work in their areas.

It has become obvious that the demand for professional officers is beginning to outstrip the supply, and that everything possible should be done to ensure that suitable school leaving material will not be denied professional training because of lack of finance or for other reasons. To assist in this direction, the Federal Government agreed to the granting of bursary loans for the purpose of enabling ten selected students to take their degrees in agriculture at approved Universities on the condition that they serve the Department of Conservation and Extension for a minimum period of four years on completion of their courses. It is hoped that this scheme will continue for several years. It will ensure a supply of local recruits to the Department which will be of very real assistance.

Apart from the reorganization and improvement brought about in the grading structure of the Department following the survey by the Interim Public Service Commission already referred to, the following important additional posts were also authorized:—

Senior Planning Officer.
Two Agricultural Topographers.
Five Conservation Officers.
One Conservation Engineer (drainage research).
Twelve African Conservation Assistants.

Apart from the above, Cabinet also approved of the appointment of the following additional staff for the specific purpose of carrying out special protection work in the catchment of the Sabi River:—

One Additional Group Conservation and Extension Officer.
Five Conservation Officers.
One Agricultural Topographer.

There is no doubt that the above additional posts will enable the Department to increase very considerably and materially its standard and output of work in the future.

The following table gives details of the staffing of the Department:—

	Authorized 30.9.55	*Authorized* 30.9.56	*Requirements*
Administration (including Professional staff at Head Office)	15	15	16
Regional Clerical Staff	9	9	9
Regional Conservation and Extension Officers	4	4	4
Group Conservation and Extension Officers	13	13	13
Additional Group Conservation and Extension Officers	17	18	19
Conservation and Extension Officers	74	79	89
Animal Husbandry Officer	1	1	1
Chief Conservation Engineer	1	1	1
Conservation Engineers	3	4	4
Agricultural Engineer	1	1	1
Mechanical Engineer (seconded from C.M.E.D.)	1	1	1
Irrigation Officers	2	2	2
Young Farmer's Clubs Organizers	1	2	3
Chief Tobacco Extension Officer	1	1	1
Tobacco Extension Officer	1	1	1
Draughtsmen	2	5	6
Farm Managers and Assistants	4	4	4
Information Officer	—	—	1
Mechanical Unit Inspectors	4	4	4
Horticulturist (seconded from Department of Research and Specialist Services)	1	2	2
Soil Technicians (seconded)	—	1	2
African Conservation Assistants	6	18	24
TOTALS	161	186	208

(b) **Visits to Other Countries**

United Kingdom. The Director made a short visit to the United Kingdom for the purpose of recruiting staff. All Universities with Faculties of Agriculture were visited and approximately 30 graduates recruited.

United States of America. Mr. H. R. Hack, Senior Planning Officer, returned during the year from a study tour of the United States which was most valuable and useful to the Department in developing its land-use planning programme. The visit was financed by the International Co-operation Administration of the United States and grateful acknowledgement is made for this generous and far-sighted assistance.

Messrs. M. G. Reid and D. G. Kennard returned from the United States where they had spent a year on irrigation farms and on a special irrigation course. The former is now back in the Department of Research and Specialist Services, whilst the latter is stationed as a Conservation Officer at Figtree where irrigation development is on the increase.

Mr. G. Turck, the Senior Irrigation Officer of the Department, left for the United States under the auspices of the International Co-operation Administration of the United States, to study all aspects of irrigation. On his return he will also visit the United Kingdom, Italy, Palestine and the Sudan for the purpose of gaining further information. He is expected back towards the end of October, 1956.

Union of South Africa. The Director visited Universities in the Union with the object of recruiting staff. He also visited the Cedara College of Agriculture.

(c) **Departmental Committees**

The Director served on the following Committees during the year:—

(i) Federal Standing Committee on Agricultural Production.
(ii) Livestock Improvement Committee (Chairman).
(iii) Natural Resources Board of Southern Rhodesia (Advisory).
(iv) Natural Resources Board of Northern Rhodesia (Advisory).
(v) Cabinet Sabi Development Committee.
(vi) Water Resources Committee of the Natural Resources Board.
(vii) Committee on Agalactia in Pigs.
(viii) Tobacco Research Board of Rhodesia and Nyasaland.
(ix) Kariba Lake Fisheries Committee.

The Assistant Director served on:—

(i) Subdivision of Lands Committee of Natural Resources Board.
(ii) Native Affairs Committee of Natural Resources Board.
(iii) Sabi Development Farm Committee.

The Chief Conservation Engineer served on:—

(i) Inter-Departmental Committee on Hydrology.
(ii) C.M.E.D. Co-ordinating Committee.

In addition to the above, other Senior Officers of the Department, at both head office and regions, served on numerous inter-departmental and other committees.

(d) **Publications**

The Department was responsible for the following publications during this year:—

(i) A Preliminary Vegetation Map of the Melsetter Intensive Conservation Area, Southern Rhodesia—Crook, A. O., R.A.J., Vol. 53, No. 1, January-February, 1956.
(ii) Short Notes on the Erection and Maintenance of Fencing — Including Gateways and River Crossings—Hack, H. R., R.A.J., Vol. 53, No. 1, January-February, 1956.
(iii) Overhead Spray Irrigation—Turck, G., R.A.J., Vol. 53, No. 2, March-April, 1956.
(iv) The Improvement and Management of Beef Cattle in Matabeleland—de la Hunt, T. E., and Poultney, H. M., R.A.J., Vol. 53, No. 3, May-June, 1956.
(v) A Simple Erosion Demonstration Machine—Hudson, N. W., Journal of Soil and Water Conservation, Vol. II, No. 3, May, 1956.
(vi) The Design of Field Experiments on Soil Erosion—Hudson, N. W., Journal of Agricultural Engineering Research, Vol. I, No. 3.
(vii) Numerous Notes and Articles by officers of the Department appeared in the *Rhodesian Farmer* and other publications.

3. TRANSPORT

In general, the transport position remained satisfactory. The use of private vehicles by Officers increased and has considerably improved the output of field staff. The Department now has a total of 31 C.M.E.D. vehicles in use, including lorries with the mechanical units. A total of 99 authorized private vehicles are in use.

4. EXPENDITURE

Vote	Item	1955–1956 Authorized	1955–1956 Actual	1956–1957 Authorized and Anticipated Expenditure
35 A	Salaries, Wages and Allowances	179,767	168,293	190,827
B	Travelling and Subsistence	14,000	11,913	16,500
C 1	Camp Equipment	750	260	200
C 2	Experimental Equipment for Conservation Works	3,400	3,266	3,400
C 3	Leave Entitlements	1,720	1,874	1,000
C 4	Office and Miscellaneous	1,250	1,592	1,800
C 5	Purchase and Upkeep of Instruments, Technical Furniture and Equipment	2,500	2,157	3,400
C 6	Recruiting Expenses	1,250	650	1,500
C 7	Water, Light and Sanitary Charges	1,350	1,304	1,200
D	Housing	16,000	16,128	16,000
E 1	Conservation Works amd Measures on European Farming Land in terms of Section 23 of the Natural Resources Act of Southern Rhodesia, 1941	15,000	177	14,000
E 2	Grass Nurseries, other Conservation Works and Measures and Field Trials	11,000	10,477	12,000
F 1	Chipinga Demonstration Farm	6,110	6,099	6,200
F 2	Karoi Demonstration Farm	5,285	5,278	5,550
G	Livestock	9,000	8,999	Nil (x)
H	Transport and Equipment	75,700	72,870	79,000
J	Transfer Adjustments	750	2,704	1
	TOTAL	344,832	314,041	352,578

(x) Now on Head Office Vote.

5. GENERAL AGRICULTURAL CONDITIONS

(a) Climatic Conditions and General

The year under review has been the third successive good one and with the exception of a dry spell during January, the rainfall distribution was excellent. Record crops were produced in spite of numerous problems of disease and pests, while grazing and water supplies remained good throughout.

(i) *Mashonaland.* The rains commenced rather late but continued well into the autumn and early winter, and a good growing season was experienced. The winter was mild and very little frost occurred. Summer temperatures were average with a rather mild spring.

(ii) *Midlands.* With the exception of a mid-summer drought, especially in the southern parts of the region, the season was generally good. Rains continued late into the autumn and the winter was very mild.

With very little damaging frost and good late rains, winter grazing was very good and consequently cattle remained in good condition.

(iii) *Eastern Region.* Rains were rather later than normal but continued until early January when a mid-season drought of up to six weeks was experienced. This was most unfortunate and crops were adversely affected. After this dry spell, the rains continued well into late autumn and made harvesting of maize difficult.

The winter was one of the driest for many years on the eastern border, because of the absence of the usual winter mists. Fortunately, temperatures were mild with little frost.

(iv) *Matabeleland.* The past season could be described as slightly above average. Rains commenced in October and continued to the end of December, enabling most farmers to plant their crops under favourable conditions. This promising early season was followed by one of the driest months of January which seriously affected the crops. At one stage it was doubtful whether sufficient silage and other fodder crops would be available on dairy farms. Fortunately, the drought broke in February and rains continued late into the autumn.

The late rains followed by a very mild winter with little frost, proved very valuable to stock.

(b) Crop Production

(i) *Food Crops. Maize.* In spite of the mid-season dry spell which adversely affected crops in many parts, the year marked an all time record production of maize. Generally, the increase in production was due to the good season as well as to better soil and crop management. The progress made by maize farmers in following improved methods of production, was undoubtedly due to the advice of the Department and results obtained at Research Stations. Improved cultural methods, the incorporation of all crop residues into the soil, higher and more accurate fertilizer applications based on soil analysis, higher plant populations and better stands generally are some of the main reasons for the increased production and higher yields per acre. It is now quite common to hear of average yields of over 20 bags per acre on farms with 400 acres and more under maize.

As a result of the late rains, Diplodia was more prevalent than usual and in isolated cases caused poisoning of cattle where the animals were allowed to graze on the stalks. The late rains also delayed harvesting and delivery of grain to the depots of the Grain Marketing Board. Helminthosporium was much less troublesome than during the previous year, which was rather surprising.

The use of chemical weed killers or sprays is on the increase and has proved very effective on many farms.

Sorghums. With the exception of isolated farmers in Matabeleland, and the Midlands, very little grain sorghums were grown. This was due mainly to the successive good rainy seasons and the damage caused by birds. The silage varieties, however, are becoming more popular in the lower rainfall parts and will no doubt serve a useful purpose especially in normal seasons.

Munga. This is still a crop of very little importance other than in crop rotations and in some instances for silage. It is generally suited to the sandveld areas in the drier parts of the country and with better management and especially improved fertilizing could be a valuable grain crop.

Groundnuts. In most parts there is evidence of greater interest in this crop and larger acreages were planted. On the lighter soils of Matabeleland especially there should be a greater interest in groundnuts which have proved a most valuable and reliable crop in these parts.

The value of groundnuts for native rations, as stockfeed and also as a cash crop cannot be over-emphasized.

Beans. In most areas beans are produced generally as a hay or silage crop and for green manuring purposes. Velvet beans and cowpeas are the most popular kinds. The season was unfavourable for hay production and consequently large quantities were very wisely turned into silage.

In the Eastern Region, green beans were produced in increasing quantities for canning and dehydration purposes. The early planted crop gave good returns. The late crop was hit by drought as well as anthrocnose. This disease is spreading and farmers are most concerned about the position.

Wheat. Very little dryland wheat was produced and until such time as suitable rust resistant summer varieties are produced, very little production can be expected.

Barley. This crop took the place of wheat on many irrigation holdings mainly because of the better price paid for it and its greater resistance to rust.

Potatoes. In general, the season was reasonable for this crop, although "late blight" caused severe damage to the summer crop in many parts. The late winter irrigated crop is fairly free from disease and good yields are expected.

Seed production by the members of the Seed Potato Association in the Eastern Disricts found a ready market and produced good results. An increasing demand for locally produced certified seed is expected.

Vegetables. With the exception of the Eastern Districts where 2,597 tons of vegetables were produced for canning and dehydration purposes, the production for the fresh market remained spasmodic and unreliable. The mild winter greatly facilitated production in the lowveld under irrigation, and where reasonable plantings were made the farmers did well. The critical shortage of vegetables, especially at certain times of the year, remains a challenge to all producers and marketing organizations.

Fruit. An increased interest in the production of fruit was noticeable, especially in the Eastern Region where many new orchards were established. The planting of fruit trees under irrigation is on the increase and this is undoubtedly a move in the right direction, even in the higher rainfall parts. Due to the efforts and advice of the Horticulturist and other field officers, there is a marked improvement in orchard hygiene.

The battle against diseases and pests is never ending but many of the problems are slowly but surely being overcome as a result of field trials and assistance and advice by advisory officers.

Banana production increased very considerably in parts of the Eastern Region, and excellent crops of good quality fruit are now slowly coming on to the market. It will not be long before Southern Rhodesia will produce all its own requirements.

There has been an increase in the planting of pineapples but it is as yet too early to judge the commercial value of this crop on a large scale. It appears that there are many problems still to be investigated and overcome before extensive plantings can be advocated.

The establishing of a canning factory at Cashel by Messrs. Liebigs (Rhodesia) Limited, will be of great economic importance to farmers in those parts. Extensive production of fruit and vegetables will be required to meet the requirements of the factory.

The development of the Hippo Valley Citrus Estate in the Chiredzi I.C.A. is also of great significance to the country and progress is being watched with great interest. There is also a steady development of citrus orchards under irrigation in the Midlands Region, mainly for the purpose of supplying local requirements.

(ii) *Cash Crops. Tobacco.* A record crop of tobacco was produced during the past season due to an increased acreage planted and a higher average yield per acre as a result of better soil and crop management. The main factors responsible for the improved standards of production are:—

(a) Early planting including planting with water both before and after the first rains.

(b) The use of well hardened seedlings resulting from, in many cases, the use of grass mulch on seedbeds.

(c) The more general use of insecticides which has resulted in better stands.

(d) The better preparation of lands with the emphasis on deep ploughing.

(e) The introduction of fertilizers better suited to the production of tobacco.

The crop on the whole was of lower quality than the previous year and the average price per pound also less. Despite the introduction of a revised classification system, the percentage of nondescript tobacco remained high. The reasons for this are considered to be the following:—

(1) The inadequacy of handling facilities on most farms.

(2) The mid-season dry period when the water requirements of the crop were at its maximum. This resulted in vigorous secondary growth after rain fell and gave symptoms typical of excessive nitrogen.

(3) Bad reaping and handling generally which led to green and slaty tobacco in a fair proportion of the crop.

There is little doubt that most tobacco farmers were unprepared for the crop of the size finally sold and this led to congestion at every stage.

The following table reflects the position in regard to the production and marketing of the crop:—

	S.R.+N.W.R. 55/56	S.R. 54/55	N.W.R. 54/55	N.E.R. 55/56	N.E.R. 54/55
Number of Growers	2,915	2,571	171	65	96
Total acreage	207,000	171,761	8,653	3,700	4,901
Sold wt., lbs. per acre	171,629,668	120,558,912	5,363,880	1,979,258	2,292,139
Average yield per acre	829	702	620	535	459
Av. crop size (acres per grower)	71	66	60	57	51
Total value of crop	£23,569,144	£20,326,475	£845,474	£196,847	£254,233
Average price-pence per lb.	32·96	40·46	37·82	23·72	27·21
Average return per acre in £	£113	£119	£98	£53	£52
Average income per crop	£8,083	£7,854	£4,900	£3,021	£2,752

The production of fire-cured tobacco is on the down-grade. Despite the average increase of over 100 lb. per acre, the cash return dropped from £41 to £29 10s. 0d. per acre. It is doubtful whether many growers will continue with this crop.

There has been a greater interest in Turkish tobacco during the past season and the crop has sold reasonably well. At present prices and with possible yields of 1,000 lb. per acre, it compares very favourably with Virginia flue-cured tobacco.

It can definitely be stated that good progress has been made in the production of tobacco, which is in no small measure due to the work of the Tobacco Research Board and the efforts of the Extension Officers of the Department of Conservation and Extension. Naturally the farmers deserve all the credit for the manner in which they have accepted and carried out recommendations for the improved management of the soil and the crop.

Cotton. Very little cotton was planted by farmers. The industry has, without doubt, received a severe setback during recent years because of insect pests, particularly Red Bollworm. The problem is, however, being tackled with vigour by research organizations in the Federation.

Tea. There was a considerable increase in plantings on existing estates. The new venture at Inyanga has already planted 250 acres with an ultimate aim of 6,000 acres. New estates are also being planned in the Chipinga area. Even in the Arcturus Valley, small trial plantings were made.

Coffee. There is a gradual expansion of this crop in the Eastern Districts where conditions are favourable.

Grass Seed. Good progress was made by members of the Pasture Seed Growers Association, and there is an ever increasing demand for good grass seed. It is anticipated that more farmers will join the Association and step up production.

Soft Woods. This is still predominantly the preserve of the Southern Rhodesian Forestry Commission and large companies, although several individual farmers along the Eastern border planted increased acreages.

Wattle. First strippings of wattle were made during the year for processing at the new factories at Inyanga and Silver Streams. Farmers continued to show interest in wattle production.

(iii) *Stock Feed.* Although there was a steady and very encouraging improvement in the production of stock feed throughout the country, lack of sufficient and suitable winter feed remained a major weakness in the cattle industry. Maize and beans, separately, or mixed, remained the most popular silage crops, while the tall sweet sorghums such as Haakdorn and Ribbon Cane became more popular in the lower rainfall regions. In the higher rainfall areas, grass silage made from Star grass and Rhodes grass is on the increase, while Napier grass is becoming less popular as a silage crop, mainly because of handling problems. Velvet beans were probably still the most widely grown for hay, while certain cowpeas and soya beans also gained in popularity.

There was evidence of a greater interest in the establishment of pastures for early spring and late autumn grazing, and in this respect Napier grass was very popular and seems to have found its right place in the fodder sequence. Another popular fodder plant was Dahl and there is little doubt that farmers could make much more use of this excellent legume for fodder purposes.

Fodder crops under irrigation increased in popularity and it was quite common to see sprays operating on irrigated grass-clover pastures on many dairy and other farms. One of the main difficulties experienced was the question of efficient management of irrigated pastures.

Lucerne under irrigation was also grown on an increasing scale for either hay, soiling or grazing purposes. In addition, crops such as barley, oats and rompha grass were grown to supply green feed to dairy cows during the winter months.

With the great need for stock feed during the normal long dry period in this country it is essential that farmers should produce much larger quantities than in the past.

(c) **Livestock**

The past year was an exceptionally good one for livestock. This was mainly due to the late rains and mild winter.

(i) *Cattle. Beef Cattle.* The marketing aspects of the beef cattle industry were examined critically by the Turner Commission, specially appointed for the purpose by Government. The main recommendations were accepted by Government and are being implemented at present. Beneficial affects on the industry are expected.

It is pleasing to report that considerable improvement in stock management was noticeable in many cases. Many farmers realized that their cattle were sufficiently valuable to justify first class attention, and there was greater interest in the provision of feed, dosing, inoculation and properly planned breeding programmes.

There was also an increased interest in cattle by tobacco farmers. This was most encouraging and with the development of grass leys in tobacco rotations, the livestock factor will assume increasing importance.

Officers of the Department, with the assistance of I.C.A. Committees, continued to emphasize the place of livestock in our farming systems. Numerous field days were organized with the main emphasis on livestock and livestock management. Specialists from the Department of Research gave valuable support in this programme.

The increased use of good bulls was encouraging and there was a keen demand for good breeding stock.

One of the major problems of the beef industry remained the low calving rate. Better management of herds and particularly the increased use of winter feed are important factors to recognize and implement. More research on this major problem of infertility is also needed.

Dairy Cattle. Steady progress was made with the development of dairy herds in the country. The interest of dairy farmers in the improvement of their herds through culling and use of better bulls was most noticeable. General management of dairy cattle improved and the dairy bonus scheme was effective in this respect.

The major problem on many farms was still the management of calves and young stock. This was mainly due to lack of good quality hay for calves and lack of proper pens and small paddocks with clean water.

Cream production was treated mainly as a sideline and was based largely on summer and autumn production off the veld. It is considered that more attention should be given to this branch of dairying in some of the more remote areas, especially where bulk feeds are readily available.

(ii) *Sheep.* Interest in sheep seems to fluctuate, but it can nevertheless be stated that there was an overall increase in the number of flocks in the country. The main difficulties experienced by farmers were labour, internal parasites and general lack and knowledge of management. Where small flocks were well run, farmers found sheep a most profitable sideline.

With the development of ley rotations, there was a greater interest in woolled sheep, particularly the German Merino, but on the whole the Blackhead Persian and Dorper remained the most popular breeds. Breeding stock was difficult to obtain and importations from the Union were quite common.

(iii) *Goats.* Where possible, farmers kept small flocks of goats mainly to supply labour rations, but it was most difficult to obtain breeding stock. There is no doubt that goats will become more popular, especially in areas where bush encroachment is a problem.

Judging from the interest at Shows, there was a marked increase in milch goats, especially on small holdings near the larger centres. This is interesting and a development worthy of full support.

(iv) *Pigs.* Pig producers were more settled than during the previous year, although the industry still had its problems, and lacked stability. In some areas there has been expansion while in others a definite decline. Generally some expansion in the industry is expected in the near future.

The help and assistance of the Pig Testing Station was appreciated by the producers and it will no doubt lead to a great improvement in the standard of production. Agalactia continued to cause severe losses in parts of the country. A special committee was appointed to investigate and deal with the problem.

(v) *Poultry.* The year again proved satisfactory for the poultry farmers and production was in keeping with the demand.

An interesting development was the establishment of a table-bird processing and cold storage plant by private enterprize in Bulawayo, which intends to supply local demand and develop export. There was also an increased interest in table-bird production in other parts of the country.

(vi) *Fish.* The development in fish farming has not been spectacular but at the same time more dams were stocked and greater use made of available fish in dams. Commercial fish production commenced on Lake McIlwaine and an investigation was carried out of the fish potential of Lake Kariba by an inter-Governmental working party.

(vii) *Livestock Improvement Scheme.* During the year, eight meetings of the Livestock Improvement Committee were held and 243 applications for grants considered. This was a small increase over the previous year. There was a welcome increase in applications from new farmers, due no doubt to the work and propaganda of the Conservation and Extension Officers.

The Livestock Improvement Committee continued to advise the Ministry on the allocation of import quotas from the Union of South Africa. The demand from farmers, particularly for grade dairy stock, far exceeded the supply and a small additional quota was granted by the Union authorities.

The quotas granted during 1955 and 1956 were as follows:—

	1956	1955
Pedigree Dairy Female Stock	193	300
Grade Dairy Female Stock	600	900
Pedigree Beef Female Stock	180	200
Grade Beef Female Stock	167	300
Pedigree Bulls	No restrictions.	

Details are given below of stock purchased and imported for farmers by the Livestock Improvement Committee as well as of stock imported by farmers on their own behalf:—

Cattle Imported from the Union of South Africa

	1.10.55 to 30.9.56	1.10.54 to 30.9.55	1.10.53 to 30.9.54
Pedigree Bulls—			
Ayrshire	—	5	6
Friesland	21	34	17
Guernsey	1	4	4
Jersey	11	12	11
Aberdeen Angus	1	—	1
Africander	158	173	234
Hereford	2	3	20
Shorthorn	1	2	1
Sussex	21	7	14
South Devon	4	—	6
Red Poll	1	1	1
Brown Swiss	1	6	1
Drakensberger	—	—	6
Brahman	1	—	—
TOTALS	223	247	251
Pedigree Females —			
Ayrshire	33	32	42
Friesland	58	33 + 1 calf	47
Jersey	54 + 1 calf	70	32
Guernsey	10	11	6
Africander	181 + 41 calves	92 + 1 calf	86 + 4 calves
Hereford	—	14	—
Shorthorn	—	—	14
Sussex	26	—	15
Brown Swiss	5	2	—
South Devon	—	—	10
TOTALS	367 + 42 calves	254 + 2 calves	252 + 4 calves
Grade Females—			
Ayrshire	—	13	—
Friesland	364 + 12 calves	500 + 9 calves	365 + 7 calves
Jersey	177	334	276 + 3 calves
Africander	4	20	—
Brown Swiss	—	8	—
Red Poll	5	—	—
	550 + 12 calves	875 + 9 calves	641 + 10 calves

Importations under Special Permits granted by the Union Department outside the quota were as follows:—

15 Pedigree Afrikander Females.

10 Grade Friesland Females.

2 Pedigree Friesland Bulls.

2 Pedigree Afrikander Bulls.

10 Grade Afrikander Bulls.

Cattle Imported from the United Kingdom

	1.10.55 to 30.9.56		1.10.54 to 30.9.55		1.10.53 to 30.9.54	
	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers
Ayrshire	5	22	—	16	—	14
Friesland	—	—	—	—	1	—
Jersey	1	—	—	31	8	62
Aberdeen Angus	—	—	3	—	1	—
Hereford	—	—	3	5	3	—
Shorthorn	—	—	1	2	—	—
Red Poll	1	2	—	—	—	—
Totals	7	24	9	54	13	78

Cattle Imported from the United States

Brahman. Seven Bulls and 32 Females.

This was the first time that Brahman cattle were imported into the Colony and they will be watched with keen interest to see how they acclimatize and do under local conditions. Two bulls and eight heifers are in the Mashonaland area and five bulls and 24 females are in the Lowveld near West Nicholson on the Ranch of Messrs. Liebigs (Rhodesia) Limited.

Sheep. Only three Dorper rams were imported from the Union.

Pigs. The only breeding pigs imported during the year were one Large White boar and two gilts from the United Kingdom.

Breed Societies. Officers of the various Breed Societies visited the country and advised members of their respective Societies. Demonstrations were arranged at several centres. These were well attended and have been most valuable and instructive to farmers and our own field officers.

When Breed Inspectors were not available, the inspections for registration of pedigree animals were carried out by the Animal Husbandry officers of the Department.

6. PRODUCTION FROM IRRIGATION

There was a steady increase in the number of and the enlargement of existing irrigation schemes throughout the country. Field officers advised extensively on the layout of projects and general soil, water and crop management.

The Senior Irrigation Officer was absent for a period of eight months on a study tour of the United States, Italy, Israel and the Sudan. The Irrigation Officer under training continued with the work on the Sabi Development Farm. Since the completion of this project he assisted farmers and officers with their irrigation problems. He also assisted with an investigation of the irrigation development and potential of the Odzani Irrigation Scheme.

There was definitely very considerable interest in year long irrigation as well as in summer supplementary irrigation and with better facilities, this development will increase. In addition to the usual irrigated crops there was an expansion in irrigated pastures and this new line of development is of importance both from the point of production of animal products and the maintenance of soil structure and fertility.

(a) Umshandige Irrigation Scheme

Development and production on this scheme was well maintained. The water supply was adequate for all the requirements of the farmers. Barley remained the most popular winter crop in the area.

(b) Umgusa Scheme

Farmers under this scheme reached a greater degree of stability and development continued to take place on a satisfactory basis.

(c) Mazoe Coloured Settlement Scheme

This scheme continued to develop satisfactorily and the settlers did exceptionally well. Some are now entirely on their own and no longer under the control of the Committee. Further improvements were made by the farmers in respect of the layouts of their holdings under the direction of the local Conservation Officer.

(d) Sabi Development Farm

The buildings and layout of the land on the Development Farm were completed during the year and the farm was advertised for occupation. The successful applicant took occupation during January, 1956.

It was unfortunate that the farm could only be made available late in the summer season, but the farmer managed to plant a small acreage to maize and sunnhemp. Both crops grew well despite virgin soil conditions and an average yield of 15 bags of maize per acre was reaped. The sunnhemp yielded 4 bags of seed per acre and, although not good, was considered satisfactory under the circumstances.

A small acreage of onions was planted and did exceptionally well. Small acreages of wheat and barley were also planted during winter and did reasonably well.

Some of the triangular sections were planted to bananas and growth was satisfactory. These plantings will be increased during the coming year.

During the coming season, the farmer will concentrate mainly on maize, cotton, lucerne and probably wheat or barley.

Generally speaking, much useful information was obtained by both the farmer and the Department and the progress made was considered very satisfactory.

7. SOIL CONSERVATION

(a) Arable Areas

(i) *General.* The basic principles of erosion control on arable land were clearly set out in the previous annual report and were applied on farms as rapidly as finance and other factors permitted. Farmers showed an increased consciousness of the fact that carefully planned use of the soil and correct soil and crop management were fundamental to erosion control.

Thoroughout the country field officers placed great emphasis on factors such as the use and management of leys in rotations, incorporation of organic matter in the soil, adequate plant populations and good stands with increased fertility as the major requirements to overcome erosion on arable lands. Where these practices were carried out, results were striking and convincing. It was most encouraging to observe the rapid improvement in this respect, although there were still far too many farmers who cultivated land and managed crops in a manner which caused serious erosion in spite of having had the usually accepted mechanical protection works.

Good progress was made with ridge and furrow layouts in areas with a high water table problem and where waterlogging occurred during heavy rains.

(ii) *Mechanical Protection of Arable Land.* Progress was well maintained during the year as the following table shows:—

Region	Period	Contour Ridges and Storm Drains	Bench Terraces	Irrigation Furrows	Pasture Furrows and Veld Ripping
		Miles	*Miles*	*Miles*	*Miles*
Mashonaland	1951/52	2,097	8	4	18
	1952/53	2,907	13	16	8
	1953/54	3,362	15	51	2
	1954/55	2,658	1	62	7
	1955/56	3,312	1	52	1
Midlands	1951/52	1,215	58	20	29
	1952/53	1,170	90	23	29
	1953/54	853	2	35	1
	1954/55	1,290	3	43	—
	1955/56	737	5	33	412
Matabeleland	1951/52	157	7	9	30
	1952/53	265	3	36	943
	1953/54	222	6	42	1
	1954/55	220	3	15	—
	1955/56	104	12	11	14
Eastern	1951/52	1,164	33	3	6
	1952/53	1,156	15	24	8
	1953/54	1,334	10	27	—
	1954/55	1,792	3	33	8
	1955/56	1,555	12	39	2
TOTALS	1951/52	4,633	106	36	83
	1952/53	5,498	121	99	988
	1953/54	5,771	23	155	4
	1954/55	5,960	10	153	15
	1955/56	5,708	30	135	427

Despite the fact that a serious shortage of staff was experienced, the above table reveals an excellent and commendable output of work. During the year, the first six African peggers were appointed and trained and certainly relieved pressure in the areas they served. With further appointments in the future, the position should improve materially and the backlog of work wiped out. The Native peggers also assisted greatly in regard to the protection of Native lands on the European farms. This was still a major problem in many areas.

(iii) *Roads and Railways.* Although erosion from roads continued to be a major problem, there was a big improvement in the position. In most Intensive Conservation Areas Committees were very conscious of this problem and actively engaged to put it right with the co-operation of farmers, Road Councils and the Southern Rhodesia Roads Department.

Erosion on some main roads was still excessive, due largely to inadequate road reserves which necessitated comparatively narrow and deep stormwater drains, instead of wide ditched ones. An increase in the width of road reserves will enable a more suitable and less eroding type of drain to be constructed.

(iv) *Native Cultivation.* This remained a difficult problem and one which many farmers were reluctant to tackle firmly for fear of losing labour. Where Committees took up this matter strongly, good progress was made and in general, the farmers were satisfied. The African peggers and Rangers were most helpful in this respect. In most cases land holding companies were most co-operative and in some cases the African tenants and labourers were completely resettled on protected land. It must, however, be realized that the protection of the African lands is only stage one of the programme and that better soil and crop management must receive attention to complete the picture, otherwise nothing will be gained and much time and energy wasted if not completely lost.

Very little streambank cultivation took place and only isolated prosecutions were necessary What used to be a major problem some years ago is now practically completely under control, due to the activity of the Natural Resources Board, I.C.A. Committees, Conservation Officers, Rangers and the co-operation of landowners.

Research

Erosion Control Research. The main works during the past year were the completion of the sandveld experiments and the continued operation and development of the two earlier groups of experiments. Preparation for a considerable expansion of the scope of the experiments is now under way and ready to commence as soon as the staff position allows.

Experiments and Main Site

Series I. No major additions were made to the field experiments of Series I. The two additional plots for stubble mulched maize were planted for the 1955-56 season and recording will start during the 1956-57 season. The planned expansion of Experiment 4 was completed when the third group of plots was planted for the 1955-56 season for recording during the 1956-57 season. All the planned field experiments are now in operation and total 6 experiments with 41 plots.

The site development included the conversion of the old workshop, including building an extension to it to form a soils laboratory comprising a main working room, balance room, store, preparation room, dark room and Kjeldhal room. The fitting and equipping of the laboratory will be completed shortly. Electric power was brought to the site and part of the laboratory wired.

A new combined workshop and store was built and houses for two more African technical assistants are under construction.

Series II. No major additions have been made to the field experiments. Site improvements consisted of laying a water reticulation scheme which is nearly complete, and building retaining walls round the collection plots. The collecting tanks have been added for the artificial slope plot, although it is not proposed to record its losses for another year. The most important experimental feature on this site is that the maize breeding programme has been transferred to another station so that it will now be possible to use commercial varieties of maize on this site.

Series III and IV. The main experiments on both sites were completed shortly after the first rains last season and functioned successfully. While the results were not complete for the season, they will be of value when considered together with the results of following years. The new access road, main bridge and culverts were completed in time to give access during the rains, and the finishing works to storm drains, etc., were added during the winter. There still remains a good deal of stumping, clearing and planting, etc., to bring these series to the high standard of appearance required, but this will be completed this season.

Crops on these sites were satisfactory but suffered damage by baboons. It is virtually impossible to drive the baboons out of the hills which are very inaccessible, and it will be a constant source of anxiety to keep them off these experiments. A 24-hour guard will be necessary, and it is hoped that the opening up and developing of this side of the station will eventually reduce the problem.

Field Scale Experiments. It was not possible to start the field scale grazing run-off experiments planned for joint operation with the Pasture Research Section of the Henderson Research Station. The other field scale experiment, also on the Pasture Research site, is on run-off from stubble mulched maize. The first crops were successfully grown during 1955-56 season and it is hoped to complete the installation of the apparatus for recording the run-off during the coming season.

Additional Projects. Due to illness, sick leave and the unavailability of further staff, the policy for the winter of 1956 and during the 1956-57 season is one of consolidation with no expansion or development other than that already committed. While this period of consolidation is very beneficial particularly after the hectic development of the last three years, the general progress of the research programme has now reached a point where expansion into laboratory and small scale experiments would be most valuable. The main experiments have given many leads which, if followed up, will add enormously to the knowledge which could be obtained from this research. Exploratory work continued slowly in many fields such as soil moisture use, storage and availability, infiltration and percolation. Approximately 20 additional projects have been prepared in detail and only await staff to put them into operation. Many of these experiments are possible, due to the new laboratory facilities.

Summary of Results

1. As last year, a season with above average in total amount of rain (38 inches) caused soil and water losses well below average because the rain was well distributed without heavy storms. The soil loss caused by one storm in 1954 exceeded the combined loss in the two seasons since.

2. Cover or protection from raindrop action continues to be by far the most important single factor affecting erosion on the red soils. The erosion from a poor cover crop (such as sunnhemp) on a 3% slope was twice that of a good cover crop (Napier or Star) on a 6% slope.

3. The high fertility maize plot continues to give remarkably encouraging results. The yield in the third year of continuous maize was again 43 bags/acre, and the soil loss negligible. Run-off was more than 5 inches less than from normal maize.

4. The mosquito gauze experiment continues to prove the beneficial effect of cover. In three years the soil loss from under the mosquito gauze totals 3 tons/acre, whereas the total from the bare plot alongside is 350 tons/ acre.

5. The experiment testing the spacing of contour ridges again showed a rapid rise of soil loss when the spacing increased beyond that normally used. The run-off is very little affected by spacing of contours.

6. A new experiment on red soils shows:—
   (a) a growing dense grass cover gave less run-off erosion than a surface mulch of cut grass;
   (b) the grass mulch was, however, very effective and gave little run-off erosion;
   (c) the frequency of cultivation has a very considerable affect on run-off. A plot given the same number of cultivations as maize mechanically cleaned, lost 2 inches of run-off, whereas a plot with 2 fewer cultivations in the early part of the season (corresponding with maize where chemical weed killers are used), lost 6 inches of run-off. This will be investigated further as on soils liable to crusting it may well be that the increased run-off at critical stages of growth offsets or reduces the advantages of chemical control of weeds.

7. The indications from the first season of the sandveld experiments are as follows:—
   (a) The idea that first year lands do not erode is completely wrong and cannot be too strongly condemned. In most cases, the loss of soil was greater than from comparable plots under continuous cropping on the red soils, and further chemical and mechanical analysis will confirm visual observations that the eroded soil contained a high proportion of the valuable finer fraction.
   (b) There appears to be, surprisingly, no significant difference between losses from high and low yielding stands of maize on first year sandveld. Neither was there much difference in yield although the "good" maize had both a higher plant population and more fertilizer.
   (c) The maize in the "Native Agriculture" 4-year rotation which received a heavy dressing of kraal manure had negligible losses of soil and run-off, and its yield (17 bags) was nearly as good as the heavily fertilized maize plot.
   (d) No comparison can be drawn between early and late planted tobacco as these plots were on graded rows and in spite of being most carefully laid out gave frequent trouble with water over-topping at low points, and invalidating the results.
   (e) Tobacco rows running down the slope appear to give approximately twice as much erosion compared with rows at 45 degrees to the slope.
   (f) Damage by baboons and poor crops generally make the comparison between good and poor yielding tobacco crops of doubtful value.

These indications taken together suggest that density of cover has not the same importance on the sandveld as on the red soils.

Other Research. Considerable research is required into the control of the water table on vlei lands to enable these areas, which constitute some 30% of the arable land in higher rainfall areas, to be productively used without damage. In addition, investigation into the control of the

seasonally high water table on the shallow soils of the Midlands is necessary. It is intended that this work be proceeded with as soon as a research engineer can be recruited.

Several other problems remain to be investigated but cannot be tackled at present. They should, however, not be long delayed as they will contribute to improving farming efficiency.

Grazing Areas

(i) *General Management.* With the greater interest in livestock production, farmers gave more attention to the veld. Progress in regard to management, although slow, showed sings of improvement.

The season was a particularly good one and consequently signs of bad management were not so obvious. Most cases of damage were mainly due to bad distribution of stock and not to overstocking. With improved management a much larger cattle population could be supported.

(ii) *Mechanical Protection.* Gully control work received more attention by Committees in several areas and arrangements were made to do reclamation work wherever possible. In the Midlands, gully erosion is a major problem on the Mopani soils and certain experimental work was undertaken to find solutions.

Ripping of bare areas was done by farmers themselves with very good results. Fortunately, there were only isolated areas where the cover had been destroyed to such an extent that it was necessary to undertake mechanical work.

(iii) *Veld Fires.* Definite progress in the control of veld fires can be reported and it was quite obvious that there was less uncontrolled burning during the past year. Many Committees put into operation systems of strategic firebreaks and co-operative fire fighting programmes with very satisfactory results.

With an increased interest in cattle, farmers protected their grazing lands better and numerous firebreaks were established all over the country.

Although there was definite improvement it must be accepted that the position is by no means satisfactory as yet. There still remains a need for improvement in the legislation in order to tighten up and increase penalties in respect of deliberate burning by irresponsible people.

(iv) *Bush Encroachment.* In most areas the encroachment of woody vegetation on grazing lands is an economic problem. Where paddocking has been done and grazing control practised, it was possible to burn, as recommended by the pasture specialists, with good effect. Unfortunately, for the major portion of the country, this is still not possible and no other means of economical control has yet been established.

In quite a number of cases, particularly in the more intensively farmed areas, farmers thinned out the bush by cutting and stumping and improved the grazing areas most effectively in this manner. Although this method is costly, it needs consideration especially where the timber can be sold or used economically.

Guavas continued to spread rapidly in parts of the Eastern districts and became a nuisance in grazing areas. *Lantana camara* is also becoming a serious problem in the Eastern Districts and Slangbos (*Stoebe vulgaris*) has a hold in some parts of the Inyanga district and is invading some poorly managed veld.

(v) *Pastures and Fodder Production.* The production of hay from natural veld decreased and was being replaced by silage and hay made from high quality established pastures. This was a development in the right direction and better quality feeds were produced for dairy cattle and for feeding beef animals.

There was a definite increase in the establishment of winter irrigated pastures especially on dairy farms. The management of these pastures still requires further investigation and varies from farm to farm. One of the most popular winter grasses under irrigation of late is Rompha. Reports in its value are still conflicting but it appears to hold great promise.

Excellent grass silage was made by farmers from summer grass pastures planted to Rhodes, Star and Love Grass. Napier remained very popular especially for early and late grazing under dryland conditions. It was quite common to see extensive plantings of this grass on many farms.

The introduction of grass into tobacco rotation brought about a rapid increase in grass seeding especially Rhodes Grass and Love Grass. This development is most encouraging and will lead to greater interest in livestock production.

A most interesting and successful venture was introduced by a farmer during the past season by undersowing his maize with grass at the last cultivation. This technique of pasture establishment will no doubt take on rapidly as it eliminates an addition preparation of the land and saves a year, which is of great economic importance.

(vi) *Fencing.* There was a steady increase in fencing throughout the country. In some centres the sales of fencing material more than doubled. The need and value of paddocking was fully realized and farmers erected as much fencing as they could finance.

8. WATER CONSERVATION

(a) Dams Built under the Guidance of the Department of Conservation and Extension

There has been a decline in the total number of dams built, due no doubt, to the affect of the tobacco prices and of a series of above-average wet seasons and the consequent abundance of water. This year there has also been a decrease in the aggregate capacity of the dams constructed, but the average size of dam is about normal.

Table A below shows an analysis of all dams built by Regions. The average size of dam reflects the continued increase in supplementary irrigation from dams.

TABLE A

Region	Period	Number of Dams	Aggregate Capacity	Average Capacity per Dam
			Gallons	*Gallons*
Mashonaland	1951/52	199	1,468,700,000	7,370,000
	1952/53	134	909,000,000	6,770,000
	1953/54	172	976,000,000	5,680,000
	1954/55	138	975,140,000	7,066,000
	1955/56	80	621,300,000	7,766,000
Midlands	1951/52	322	848,000,000	2,640,000
	1952/53	132	462,610,000	3,500,000
	1853/54	113	648,000,000	5,720,000
	1954/55	101	388,670,000	3,848,000
	1955/56	95	464,705,000	4,892,000
Matabeleland	1951/52	225	609,200,000	2,710,000
	1952/53	137	556,850,000	4,070,000
	1953/54	193	911,600,000	4,720,000
	1954/55	137	649,680,000	4,820,000
	1955/56	153	527,300,000	3,450,000
Eastern	1951/52	92	350,000,000	3,810,000
	1952/53	62	329,000,000	5,300,000
	1953/54	57	56,000,000	1,000,000
	1954/55	34	149,460,000	4,395,000
	1955/56	25	34,700,000	1,388,000
TOTALS	1951/52	828	3,276,000,000	3,900,000
	1952/53	465	2,257,460,000	4,850,000
	1953/54	535	2,591,600,000	4,840,000
	1954/55	410	2,162,950,000	5,275,000
	1955/56	353	1,648,005,000	4,680,000

An analysis of dams built by farmers, I.C.A. Committee units and Government units is shown in Table B below, which reflects the decrease in I.C.A. Committee-owned units due to a decrease in the demand for dams. In past years I.C.A. units have consistently built the largest number of dams, but this year it will be seen that these units have built the least number. It is gratifying, however, to note that the number of farmer-built dams remains fairly high.

TABLE B

Year	Farmers		I.C.A. Committee		Government Units		Total Number
	No.	%	*No.*	%	*No.*	%	
1951/52	180	21·5	415	49·5	243	29·0	828
1952/53	126	27·0	208	45·0	131	28·0	465
1953/54	194	36·5	234	44·0	102	19·5	535
1954/55	149	36·0	167	41·0	94	23·0	410
1955/56	130	36·9	84	23·8	139	39·3	353

(b) Catchment Scheme

(i) *Umzingwane.* Good progress was made with the work planned in this catchment but will be continued during the coming year. The Committee and landowners gave full support to the scheme and the Native Department assisted with the work in that part of the catchment falling in the Native Area.

(ii) *Cashel.* Most of the work was completed and the recovery of veld and natural water supplies is most gratifying.

(iii) *Tanganda.* The work planned was finalized by the Natural Resources Board and the local I.C.A. Committee and the movement of Natives and Native lands from the vicinity of streams banks progressed satisfactorily. Other works such as fencing will follow during the coming year.

(iv) *Inyanyadzi.* This catchment was carefully investigated and the areas causing most silting in the Native area were fenced and some movement of Natives and their lands undertaken. It is fully anticipated that this area will now fully recover and become stabilized. The Committee deserve credit for the active manner in which the problem was tackled and finalized.

(v) *Umsweswe.* Further work was carried out by the Native Department in the Mondoro Reserve in co-operation with this Department. In general the major works planned in this catchment have now been completed.

(vi) *Sebakwe.* A considerable amount of work was done in this catchment during the year. These works consisted mainly of fencing, dam construction, gully control, bolstering and ripping of old roads and bare areas. These works proved most valuable and effective, but one of the major problems, viz.: the control of gullies in the Mopani soils remains unsolved. Several trials are in progress and it is hoped that some effective means will be found to control this insidious erosion.

(vii) *Lundi.* Most of the work planned in this catchment for the protection of the Gwenora dam was completed and the outstanding works will receive attention during the coming year.

(viii) *Kyle.* With the increased development in the lowveld and the possibility of constructing the Kyle dam, it became necessary to investigate the catchment and commence operations for its protection. This work will continue during the coming year. The Committee and landowners gave full support to the proposals and the fencing is being done on contract by the farmers themselves.

(ix) *Umwindsi.* The protection of this catchment remained a problem due to the expansion of Salisbury and consequent subdivision of land in this catchment. Farmers dependent on the water of the Umwindsi River were most concerned and the I.C.A. Committee again made strong representations to the Natural Resources Board for investigation and institution of some positive action to ensure their water supply. The only possible solution appears to be the construction of large dams but this will depend on finance and Government policy.

(x) *Bembesi.* With the possibility of a major dam being constructed on the Bembesi, it will be necessary to have this catchment investigated in the not too far distant future.

(xi) *Sabi.* The I.C.A. Committees in this catchment have had this matter under consideration for some time and a meeting of Ministers and others concerned was organized by the Natural Resources Board, in order to obtain a clear picture of the magnitude of the problem. The Government has now approved in principle that the work must be put in hand and provision has been made for the necessary staff in both this Department and the Southern Rhodesia Department of Native Agriculture.

Full investigation will be instituted and the work commenced during the coming year. In the Native areas some of the work is already in hand. The protection of this catchment is certainly of the utmost importance.

(c) **Vleis and Sponges**

Due to the succession of good seasons, the vlei and sponge areas generally remained in good condition. Where such areas were fenced in the recovery has been excellent. In the main there was very little damage to sponge areas as most people are now keen to protect them.

The better use of our wet areas still requires further investigation and this work will be actively undertaken as soon as an officer can be appointed for this purpose.

9. SURVEY OF MECHANICAL UNITS

(i) *I.C.A. Units.* As stated previously, there was a further decrease in the number of I.C.A. Committee owned units due to a decline in the demand for dams and other services. In spite of their depleted numbers, they are still performing a most useful function and their retention should be encouraged where this is financially sound.

These units continued to show a higher output of productive hours and less time lost due to

breakdowns and moving than Government units. A comparative analysis is shown in Table C below:—

	Government Units (S.R.)			I.C.A. Units		
TOTAL HOURS—	1953/54	1954/55	1955/56	1953/54	1954/55	1955/56
Average Tractor hours per month	227	239	252·3	240	226	224·2
Percentage	100	100	100	100	100	100
PRODUCTIVE HOURS (including servicing) Average hours per month	112·4	122·8	130·6	143	143·6	155·8
Percentage	49·5	51·2	51·5	59·6	63·5	69·5
Time spent moving per month	14·9	14·5	13·2	6·9	7·3	5·3
Percentage	6·6	6·0	5·3	2·8	3·3	2·3
Time lost due to Breakdowns— Per Month	45·2	38·1	39·6	32·8	21·5	29·5
Percentage	19·9	15·8	15·8	13·7	9·5	13·2
Time lost due to other causes— Per Month	54·5	44·6	68·9	57·3	53·6	33·6
Percentage	24·0	27·0	27·4	23·9	23·7	15·0

(ii) *Government Units.* These units continued to function fairly satisfactorily, but valuable time was lost due to the prolonged rainy season. Breakdown time rose during the past 12 months due to increasing delays in repairs, but the overall loss of time for the year remained the same as last year and was still too high.

Because of the abundance of water and the uncertainty of tobacco prices, the farming community have not readily asked for dams to be built. It has, consequently, not been possible to draw up any lengthy programmes of work but there have been no delays worth mentioning due to this. It has, however, on occasion necessitated long-distance moves to keep machines fully employed.

In addition to dam building, some 1,600 acres of land were stumped, mainly in Mashonaland and Midlands regions.

10. FIELD TRIALS

In consultation with the Department of Research and Specialist Services all field trials were standardized and this proved valuable and effective. In some cases, difficulties were experienced and some trials could not be supervised properly due to resignations or transfer of staff. In spite of these difficulties, valuable results were obtained and it is essential that the research findings should be incorporated in the field trials for further observation. Some of the trials such as the stubble mulch trial and pasture trials are long term and results will only be available after some years.

In general, farmers were keen on the trials and were watching the progress with interest. Valuable assistance was obtained from most farmers where trials were established.

In the lowveld areas the I.C.A. Committees, in co-operation with some ranchers, have commenced veld management trials as recommended by the Department and the Pasture Research Officers. These trials should be most instructive in time to come. It is hoped to commence a similar type of trial in the Midlands, using both cattle and goats for grazing and to study the effect on bush control.

The following table gives an idication of the trials undertaken:—

FIELD TRIALS, 1955/56

	Trace Elements on Legumes	Nitrogen Phosphate and Potash presence and absence Trials	Stubble Mulch	Population Fertilizer	Fertilizer Placement	District Maize Varieties	Drainage Trials	Total
Eastern	2	—	3	12	2	2	—	21
Midlands	—	2	3	6	1	3	1	16
Mashonaland	1	3	2	10	1	3	—	20
Matabeleland	—	—	—	—	—	—	—	—
	3	5	8	28	4	8	1	57

11. ADVISORY SERVICES

(a) General

This aspect of the Department's work increased in importance and farmers were seeking the advice and guidance of our officers to a much greater extent than previously, on all aspects of agriculture. It is definitely realized that good farming and conservation is but one and greater emphasis on soil, crop, veld and livestock management is undoubtedly the correct and most stable line of approach.

We were indeed grateful to the Staff of the Department of Research and Specialist Services who so willingly assisted with specific problems from time to time. This co-operation was no doubt of mutual benefit. The help, guidance and assistance field officers received from I.C.A. Committees and many of our successful farmers were also of very real value and appreciated by the Department.

The following table gives an indication of the number of visits undertaken by officers during the year:—

VISITS MADE BY OFFICERS OF THE DEPARTMENT

	Meetings Attended	Eastern Region	Midlands	Matabele-land	Mashona-land	Total
1	I.C.A.'s Group Committees	246	442	124	533	1,345
2	Farmers Associations	47	126	32	137	342
3	Road Council	40	29	7	100	176
4	Young Farmers' Clubs	—	58	9	39	106
5	Staff—Group and Regional	153	216	47	252	668
6	Miscellaneous Meetings	152	143	36	283	614
7	Visits with Committees and I.C.A. Business	294	242	144	386	1,066
	TOTAL	932	1,256	399	1,730	4,317
	INSPECTIONS					
1	Soil and Water Conservation Subsidy	104	125	48	344	621
2	Water Court	226	78	30	174	508
3	Sub-division	32	47	27	180	286
4	Timber Cutting	4	33	3	6	46
5	Livestock Improvement Scheme	144	124	19	127	414
6	Graziers	—	7	—	—	7
7	Dairy Bonus Scheme	—	2	—	14	16
8	Land Bank and Rehabilitation	—	—	—	19	19
9	Land Settlement Board	—	24	6	79	109
10	Crown Land	59	60	19	18	156
11	Grass Seed Association	28	21	—	67	116
12	Miscellaneous	416	681	182	750	2,029
	TOTAL	1,053	1,202	334	1,838	4,427
	ADVISORY					
1	Farm Planning	487	817	151	797	2,252
2	Extension	1,213	1,896	221	1,488	4,818
3	Conservation—advisory Pegging	413	1,698	655	3,513	6,279
4	With Irrigation Engineers	—	64	94	194	352
5	Mechanical Units	—	297	315	710	1,322
6	Miscellaneous	955	290	202	757	2,204
7	Irrigation Layouts	83	205	164	143	595
8	Experimental Stations	148	151	39	299	637
9	Farmers' Days	46	123	30	206	405
10	Field Trials	—	543	—	—	543
11	Roads Departments and Councils	—	90	—	—	90
12	Grass Nurseries	—	344	—	—	344
	TOTAL	3,345	6,318	1,871	8,107	19,641
	TOTAL ALL VISITS					28,385

(b) Farm Planning

The programme of farm planning commenced last year has been pursued, but due to numerous staff difficulties did not progress as well as was anticipated. The demand for assistance by farmers increased tremendously and there is clear evidence of the value of this work.

We were fortunate to improve our own knowledge and develop new and up-to-date techniques in this field of work as a result of the intensive study which was made by Mr. Hack, the Senior Planning Officer, in the U.S.A. It is anticipated that this new line of approach and application will bring about rapid improvement and develop planning in all areas. Where farmers became acquainted with this work, there was an immediate response for assistance, but until such time as Officers are trained and aerial photographs become available, it will not be possible to fully implement the scheme. It is hoped that all areas will be photographed in the near future and that re-photography of areas done years ago will commence. Fortunately up-to-date photographs are available for many areas and planning can go straight ahead.

The following table indicates the present position:—

FARM PLANNING, 30TH SEPTEMBER, 1956

	Applications approved.	*Under Development.*	*Completed.*
Eastern . . .	100	36	5
Midlands . . .	141	79	29
Mashonaland . .	108	82	19
Matabeleland . .	60	39	9
Totals . . .	409	236	62

It is hoped that within the next 12-18 months, our staff, with the assistance and co-operation of farmers and I.C.A. Committees, will be able to complete farm plans at the rate of 800 to 1,000 per annum.

(c) **Farmers' Days**

In most areas one or more field days were organized with great success by I.C.A. Committees. These gatherings are becoming more and more popular with farmers and it is appreciated that much can be gained and learned from these visits and demonstrations as well as from the discussions which invariably follow between the farmers themselves.

A total of 109 field days of various kinds were organized, dealing with all aspects of agriculture and were in many cases combined with meetings of I.C.A. Committees or Farmers' Associations.

(d) **Shows**

Officers of the Department assisted at most of the shows as judges and stewards and some also served on Show Committees. At all centres the Department staged exhibits which emphasized the importance and place of livestock production in our agriculture.

Some of the smaller shows were not quite up to the usual standard whereas there was improvement in others. The Royal Show at Salisbury was an outstanding success and the cattle parade probably the finest ever seen in Southern Africa.

(e) **Teachers' Courses**

Short courses for teachers were again organized in co-operation with the Department of Education and the Natural Resources Board at Gwelo and Bulawayo. Both courses were most successful and the teachers expressed their satisfaction and appreciation at the conclusion of the programme.

The need for improvement and further development of these courses is obvious, but until such time as a permanent officer is available, to give nearly full time attention to in-service training, and initiate new lines of thought, it will be difficult to change.

Satisfactory arrangements were made with the Education Department for the teaching of Conservation at the Teacher Training College at Bulawayo. This is considered a great step forward.

It must be realized, especially by those responsible for the education of our youth, that conservation is largely a way of thinking and a way of living. Dale and Carter, in "Topsoil and Civilization", wrote that "Conservation is as fundamental as honesty and thrift and it must be achieved in much the same way. The only way true conservation can be achieved is through universal education toward that goal. The education must be started early in the life of every individual and continued for as long as he or she is an active participant in our economic and social life."

(f) **In-Service Training**

The in-service training of Officers was continued and a special short course on land-use planning was organized and put into operation.

The training of Officers on tobacco farms for a full season is proving most valuable and is being continued. In addition, various short courses were organized for training in specialized fields. The value of this type of training cannot be over-emphasized, and is of vital importance to ensure successful operation in the field. It is hoped to have a Senior Officer available in the future who could, as part of his duties, organize this aspect of our work on sound lines.

A special course of training has also been designed for the training of recruits. All recruits now receive intensive training for a period of two months under the guidance of Group Officers. This is considered essential to acquiant these officers with the problems in the field and enables them to get an appreciation of the requirements of the Department and the farmers.

(g) **Agricultural Engineering**

This branch of our advisory service is of necessity very restricted due to the limited staff available. The investment in plant, equipment, buildings and structures by farmers is enormous, and faulty maintenance, use and purchase of plant and equipment, and poor design, layout and con-

struction of farm structures is costing the farming community large sums annually. On plant and equipment alone, if efficiency can be improved by only 5% by our advisory services, it is estimated that the farming community will be saved some £150,000 per annum.

Assistance and guidance were provided to farmers in respect of their building operations, as well as in respect of farm equipment, but it has not been possible to attend to all the requests due to shortage of staff. The vacant Engineering post was filled only recently and we hope to improve our service to farmers in this respect during the coming year.

(h) **Young Farmers' Clubs**

The year marked progress of the movement in many respects. Not only has there been an increase in the number of clubs declared as a result of the decision by the 1955 Annual General Meeting that the Movement should be unfrozen, and the appointment of an additional Organizer, but there has been greater activity by clubs as illustrated at the second National Camp, at Shows, and with the project work at club centres.

The progress made was naturally due to the work and interest of the members themselves, but in no small measure also to the excellent guidance of Club Leaders, Advisors and the Organizers. The need for adequate training of Club Leaders and members is apparent but the necessary staff, finance and time to undertake this important part of the work is not available. It will be appreciated that it is impossible to undertake any training programme with only two full-time Organizers to develop the Movement, assist and guide existing Clubs and Regional Committees, organize rallies and Show programmes, arrange international exchange itineraries, and the other numerous activities and club projects.

Good progress has been made by Regional Committees considering that they have only functioned for a comparatively short period, and they have no doubt taken quite a load off the shoulders of the Organizers.

With the appointment of a second Organizer during the year, it was possible to assist the many clubs previously trying to find their feet. As a result, several of these clubs proved themselves and at the end of the year, a total of 34 clubs had been declared, consisting of 23 junior, 9 intermediate and 2 senior clubs. At the same time, several more Clubs are on probation and more centres are interested but cannot be assisted as yet.

The staff position insofar as this Movement was concerned was indeed critical. With the interest in and demand for assistance in Northern Rhodesia and Nyasaland, it is imperative that more Organizers be appointed soon.

The second National Camp was organized to coincide with the Royal Show and was indeed a great success. Exchange visitors were present from the United Kingdom as well as Kenya, Northern Rhodesia and Nyasaland. It was also possible to send two members to the United Kingdom on an exchange visit with excellent results.

The value of the Movement is perhaps not always fully appreciated and valued by all concerned, but it is interesting to quote from a member who wrote as follows:—

> "I joined Y.F.C. as one interested in country life, livestock, and that was about all. During the past four years, Y.F.C. has inspired in me, over and above farming knowldge, a deep interest in people and community service, and a far greater understanding of life."

This is certainly an indication that the Y.F.C. Movement is achieving its aims.

It must be realized that the Y.F.C. Movement is not merely producing items of machinery to a set formula, developing a machine to produce a fixed type of article, or providing amusement and incidental experience for a younger age group. It is developing the Nation's future citizens, helping to build character, the correct outlook, all the things which could produce the Nation's leaders of tomorrow, people with a purpose in life. This is a great responsibility on the shoulders of those who guide the Movement and we are indeed most grateful to the members of National Council and other Committees, and all others who gave of their time so freely and voluntarily for this great purpose.

12. DEMONSTRATION FARMS

(a) **Chipinga Experimental-Demonstration Farm**

Although the total rainfall on the farm was only 35.78 inches, which was very much less than the previous season, the distribution was good and consequently crop production excellent.

A total of 1,200 bags of maize was reaped with an average yield of 14 bags to the acre. Approximately 400 tons of silage was made for the dairy stock and an additional 34 acres established to pasture.

A planned programme of development is being followed and it is fully anticipated that the scheme will be in full operation during next year. The irrigated pastures did well and greatly assisted in the production of the dairy herd.

This herd has done well and a total of 25,847 gallons of milk was produced and sold to the Cheese Factory plus 231 lb. of butterfat.

Good crops of vegetables and sweet corn were produced for the Canning Factory at Chipinga.

The farm is a popular spot amongst the farmers and with the assistance of the I.C.A. Committee, regular visits are arranged to it. The development of better farming in this area is largely due to the information passed on from this station.

(b) **Karoi Experimental-Demonstration Farm**

The development plan is almost in full operation and a beef herd was introduced as reported previously.

The total rainfall for the year was 40.27 inches and was well distributed. The maize crop was the best ever produced with an average yield of 19.7 bags to the acre. Pastures grew well and additional plantings were most successful. Excellent silage was made from grass as well as from legumes.

The dairy and beef herds did well and were grazed on the pastures followed by the sheep during most of the year. This intensive development of the farm is of interest in the area and has certainly created new developments on many farms.

The sheep did well and were most productive. Dorper rams will be used in future on the Persian ewes, to improve the mutton qualities. There was throughout a good demand for breeding and slaughter stock.

The pig herd developed satisfactorily and a Landrace boar was obtained for breeding purposes.

The two local I.C.A. Committees were most helpful in the planning of the farm programme and their advice was appreciated at all times. A most successful Farmers' Day was held and farmers visit the farm regularly whenever they have problems for discussion with the staff.

Complete records of production are now maintained and these should be of value and interest to the farmers as well as ourselves in order to detect any weaknesses in the programme.

(c) **Whole Farm Demonstration Scheme**

Further applications were received during the year and a few withdrew from the scheme for various reasons. At present there are still seven farmers operating under the scheme and these will probably continue.

On the whole, it has been possible to implement a planned programme on most of the properties and the Advisory Committees have been of great assistance. It is as yet too early to express an opinion on the success of the scheme except to state that in a few cases it has brought about very definite improvement in the stability of the units. It has, however, been decided not to invite any further applications for the present.

13. SOUTHERN AFRICAN REGIONAL COMMITTEE FOR CONSERVATION AND UTILIZATION OF SOIL

The Director attended the meeting of the Southern African Regional Committee for Conservation and Utilization of Soil which was held in Swaziland, followed by a tour of Swaziland and Basutoland. The meeting and tour were most successful and resolutions were submitted to member Governments. The guidance and assistance received through this organization is highly valued and has already produced rich dividends.

NORTHERN RHODESIA

As already indicated non-African Agriculture, i.e. European Agriculture, in Northern Rhodesia, became a Federal responsibility on the 1st January, 1956. From that date this Department became responsible for all conservation and extension services in the European area of that territory.

1. ORGANIZATION

Prior to 1st January, the Northern Rhodesian Department of Agriculture operated a small, efficient Soil Conservation Service which did excellent work among European farmers. At the same time the Department of Veterinary Services was responsible for advising farmers on all aspects of livestock production as well as for the administration of several schemes for the improvement and increased production of livestock.

As a result of the federalization of non-African Agriculture the following posts were transferred from the Northern Rhodesia Departments of Agriculture and Veterinary Services to the Ministry of Agriculture.

No. of Posts.	*Designtion of Posts.*
1	Assistant Director.
1	Accountant.
1	Chief Conservation Officer.
1	Chief Agricultural Officer.
5	Agricultural Officers.
3	Agricultural Supervisors.
2	Livestock Officers.
2	Dairy and Poultry Officers.
10	Conservation Officers.
8	Conservation Supervisors.
1	Mechanical Engineer.
1	Chief Tobacco Adviser.
4	Assistant Tobacco Advisers.
3	Tobacco Supervisers.

In addition to the above the full complement of posts attached to the Workshops and Mechanical Units as well as the necessary administrative and a number of African posts were transferred.

As the Federal Government had undertaken, in collaboration with the Northern Rhodesia Government, to provide Northern Rhodesian farmers with a Conservation and Extension Service at the same level as that enjoyed by Southern Rhodesian farmers, considerable reorganization was necessary to bring the new Service in line with the more mature Southern Rhodesian one. As a result of this additional posts had to be created and staff provided. It was unfortunately not possible to fill all the new senior and specialized posts from among the Northern Rhodesian officers who came over on transfer and it was consequently necessary to transfer several officers from Southern Rhodesia to fill some of these posts.

The organization of the Northern Rhodesia Region of the Federal Department of Conservation and Extension was finally constituted with the following complement of staff:—

No. of Posts	*Designation of Posts.*
1	Assistant Director of Conservation and Extension.
1	Regional Conservation and Extension Officer.
1	Additional Regional Conservation and Extension Officer.
4	Group Conservation and Extension Officers.
4	Additional Group Conservation and Extension Officers.
18	Conservation Officers.
1	Senior Animal Husbandry Extension Officer.
1	Senior Tobacco Extension Officer.
1	Senior Conservation Engineer.
2	Dairy and Poultry Officers.
1	Horticulturist.
1	Planning Officer.
1	Irrigation Officer.
2	Agricultural Topographers.
1	Farm Superintendent.
5	Farm Managers.
1	Farm Assistant.
1	Senior Executive Officer.
2	Higher Executive Officers.
8	Male Clerks. Female Clerks.

In addition to the above there are also the staff attached to Workshops and Mechanical Units and African staff.

With the exception of a few specialist posts which are still required it is considered that the Department is now in a position to give farmers in Northern Rhodesia all the necessary advice and guidance they may require over the entire field of agriculture.

It is expected that the administration and organization of the Department will require at least the coming year as a period of adjustment before it finally settles down.

It is a particular pleasure and privilege to record here the wholehearted co-operation and assistance received throughout the period under review from the officers who came over to the Federal Service on voluntary secondment. Without their assistance and guidance the task of building up a considerably enlarged service in so short a time would have been virtually impossible.

2. GENERAL POLICY

Regional planning continued to form the major effort of the Department. In areas where no regional planning had been started staff carried on with normal field work. As the various specialists became familiar with local conditions and problems closer liaison became possible with field staff and the extension activities of the Department developed considerably.

It is intended during the coming year to formulate, in consultation with the Natural Resources Board, a clear cut conservation policy which will be followed by the Department and all others concerned. This will give guidance and will prove of considerable value to staff, the Northern Rhodesian Natural Resources Board, Committees and farmers.

3. GENERAL PROGRESS OF WORK

Due to staff and other changes the output of mechanical work was not as great as during the previous year. There was, however, a considerable expansion in extension work.

From Table I it will be noted that a considerable increase in contouring will have to be done to protect lands which have been opened up.

TABLE I—DETAILS OF MECHANICAL WORKS INCLUDING ALL REGIONAL PLAN WORKS

Type of Work	Pegged	Acres	Constructed by Farmer	Constructed by Govt. Machinery
Contours	323,363 yds.	3,000	283,930 yds.	39,433 yds.
Storm Drains	69,533 yds.	6,000	4,000 yds.	65,533 yds.
Fireguards	84 miles	—	—	84 miles
Roads	74 miles	—	26 miles	48 miles
Fence Lines	102 miles	—	15 miles	87 miles
Waterways	11,500 yds.	—	1,200 yds.	11,380 yds.
Bush clearing	—	9,101	—	9,101 acres
Miscellaneous	—	100 (irrig. layouts)	—	—
Dams	**No.**	**Capacity**	**Cu. yds.**	
Major	5	74 million	46,551	
Small	19	10 million	9,000	

A large number of storm drains were built mainly in regionally planned areas by the Government Units. There was a decrease in the amount of fireguards. This was due to more control being exercised, as without proper maintenance they do not serve their purpose. The units also assisted Road Boards to construct certain roads. Close liaison was maintained with road authorities and advice and guidance given on alignment and drainage problems.

The acreage of bush cleared is the only item which exceeded the previous year's figures.

Very few dams were constructed mainly because finance for the Mazabuka and East Lusaka Regional Plans was not available until July.

In Table II details are given of visits by officers to farmers, meetings, etc.

TABLE II—VISITS

	Southern Group	Mazabuka Group	Lusaka Group	Central Group	Eastern Group
Farm Visits	590	440	588	355	180
Diff. Farms visited	159	79	230	70	40
I.C.A. and Fire Board Meetings	34	14	50	14	1
Road Board Meetings	—	—	5	—	2
Water Board Meetings	—	2	—	2	—
Field Days	2	—	2	2	—

4. REGIONAL PLANNING

In August, 1953, the Northern Rhodesia Government approved the Regional Planning scheme put forward by the Natural Resources Board for an experimental period of three years, commencing on 1st July, 1954. Progress was reported to the Intensive Conservation Area Conference in October, 1956, and detailed figures given of works done on the Regional Plan.

It is convenient to consider Regional Planning in three phases:—

(a) Aerial Photography.

(b) Mapping and Planning.

(c) Execution of the plan.

(a) **Aerial Photography**

With the exception of European Crown Land in the Mwinilunga, Eastern Province and Abercorn areas, all European farming areas in Northern Rhodesia have been photographed from the air. Photographs on a scale of 1: 20,000 and 1: 10,000 are available at the planning offices.

(b) **Mapping and Planning**

The following areas have been mapped and planned:—

Mazabuka.	
Lower Kaleya	70,124 acres
Upper Kaleya (Pilot Scheme)	10,053 acres
Upper Kaleya (New Scheme)	7,728 acres
Middle Kaleya	57,884 acres
Mazabuka	116,987 acres
(Passed by Natural Resources Board but has still to have Minister's approval).	
West Lusaka.	
Cheta River	31,121 acres
Chilongolo	61,008 acres
East Lusaka.	
Chalimbana	100,729 acres
Broken Hill North	110,161 acres
TOTAL	565,795 acres

Therefore the total acreage planned and prepared for development is 565,795 acres. This has been done in 2½ years.

In addition, work proceeded on plans for:—

South Broken Hill (120,000 acres) has been mapped and should be ready for approval in July, 1957. This covers the whole area except the section east of railway line.

The Flats margin area at the bottom of the Kaleya Valley (31,000 acres) has been mapped.

The total Kalomo area has been mapped and the land utilization types of this area will be continued with. About 40,000 acres in North Kalomo and 40,000 acres in South Kalomo should be finalized by July, 1957.

Thus by July, 1957, it is expected that at least 760,000 acres will be planned.

The priorities for future areas will be decided by the Federal Minister of Agriculture on the recommendation of the Natural Resources Board.

(c) **Execution of Plans**

The major mechanical works are almost complete except in the East Lusaka (Chalimbana) and Mazabuka plans which have only recently been passed.

The establishment of fencing and boreholes has not developed as much as one expected, and a considerable proportion of the funds are still available for this purpose.

Cheta River. Apart from finance for 31.38 miles of fencing, no other monies have been spent on this Regional Plan. The position remains much the same as compared to the previous year.

Chilongolo River. The heavy mechanical works are complete except for one farm. During the year, 11 miles of fencing and two boreholes were completed, and a further 276 acres stumped.

This leaves a considerable balance of monies, mainly for fencing and boreholes, which have yet to be taken up.

Chalimbana River. This plan was passed in 1956, and as yet it is too early to analyse the figures. A few dams, storm drains and contours have been built. The mechanical units are at present working in the area.

North Broken Hill. Designed layouts, a few small dams and sumps, fence lines and bush clearing were done during the year by the mechanical units. £25,823 still remains available for fencing and boreholes. The financing of the purchase of fencing materials before the subsidy is paid, still remains a problem.

Middle Kaleya. 13.3 miles of fencing and four boreholes costing about £1,451, plus four miles of fence lines and £281 spent on gully control is the total amount of work done in this area during the year. The balance of £16,498 2s. 9d. is mainly for weirs, boreholes and fencing. The machinery work is complete.

Lower Kaleya. A considerable amount of work has now been done in this area. The two large dams have been completed at a cost of £4,720 10s. 0d. Other works include small dams, storm drains, waterways, boreholes, fencing and bush clearing. The heavy machinery work is now complete and the main items still to be completed are fencing, weirs and boreholes. A balance of £6,992 8s. 6d. still remains for this work to be completed.

Mazabuka. The plan is still awaiting approval by the Minister.

General Remarks on Regional Planning

Close contact by the Conservation Officer must be maintained to ensure that the works are being carried out, and to provide the necessary guidance for correct land use.

The co-ordination of all the Land Utilization types in the different areas will be classified. Also method and procedure to be adopted for Regional Planning will also be standardized and written up.

Those areas which may not be regional planned in the near future, need not delay development, as mapping and planning will also continue in those areas.

The final development of Regional Planning is to guide the farmers into correct land usage, and with the full co-operation of all farmers and Intensive Conservation Area Committees, this can be done.

Regional Planning has shown up one undesirable effect in that it holds back development in areas awaiting planning. This matter is being gone into.

5. CONSERVATION ENGINEERING

(a) **Mechanical Units**

The strength of the tractor fleet consisted of the following machines, together with ancillary equipment, such as scrapers, bulldozers, rippers, ploughs, stumpers, etc.:—

3 D8 CaterpillarTractors.
10 D7 Caterpillar Tractors.
2 D6 Caterpillar Tractors.
3 D4 Caterpillar Tractors.
2 VR 180 Rolls-Royce Tractors.
1 Adams Motorized Grader.

The following represents an analysis of the working hours performed by the various classes of tractors, and the efficiency based on a target of 170 tractor hours per month per machine.

Tractor Class	*No.*	*Total Hours*	*Av./Machine/Month*	*% Efficiency*
D8 Cat. Tractor . . .	3	1,696	62·8	37%
D7 Cat. Tractor . . .	10	9,054	100·6	59%
D6 Cat. Tractor . . .	2	763	42·5	25%
D4 Cat. Tractor . . .	3	748	27·7	16%
VR 180 Tractor . . .	2	1,191	66·3	39%
TOTAL	20	13,452	75	44%

No work whatever was done by the Adams grader for the period under review.

These figures make extremely distressing reading, and show a great reduction in output from the previous record. The following were the main reasons for the fall-off in output of work:—

(i) As from 1st July, 1956, new conditions of hire, as outlined in Federal Notice No. 303 of 1956, were introduced. Under these conditions, applicants are required to pay one-third deposit, and the rates of hire were increased by approximately 30%. This change was necessitated by heavy operating losses in the past, and are still below the economic running costs, but has caused a certain reluctance on the part of farmers to apply for the services of the units.

(ii) Shortage of Conservation staff prevented the degree of canvassing for work and publicizing of the units that are inevitably necessary.

(iii) An exchange of the machines other than D7s. for further D7s. was proposed. These machines were recalled to Workshops for overhaul prior to the exchange, which then fell through.

(iv) After an excellent start, the two VR 180 machines have totalled 120 hours for three months. This was caused by both machines developing serious problems of overheating. A structural alteration was introduced to the air intake system, but this appears to have little effect.

(v) The D4 tractors, though in reasonably sound condition, have to compete with privately owned farm tractors for the type of work they are suitable for, and are largely redundant.

(vi) The tractor strength is excessive for the amount of work offered.

The analysis shows the complete superiority of the D7 Caterpillar over all other classes of machine for our particular type of work. This tractor, through its great versatility for the type of work on offer, has been in greatest demand. Of the machines on strength, it also happens that the D7s. are in the best condition, but it is also a tractor which, in general, is easier to maintain than the other types.

Administration and maintenance costs were inflated by the necessity to carry excessive spares for the variety of tractors on hand. In order, therefore, to improve the present unsatisfactory position, the following was proposed, and negotiations are in hand to give effect to the proposal:—

(i) Reduction and standardization of the tractor fleet by disposing of all machines other than D7 tractors (including the road grader), together with all ancillary equipment and spares which would then become surplus. As a first step, the D8 tractors would be retained temporarily.

(ii) Delaying the purchase of any additional machines as replacements until a clear need for them arises.

An increase in the Conservation staff, as is expected soon, will also lead to an increase in planned works, which will automatically increase the demand for the units.

It is obviously impracticable, until efficiency of operation can reduce running costs, to recommend a reduction of charges. I have no doubt, however, that the waiving of the deposit (at present in force until 1st May, 1957), would improve the position.

The work done by the units consisted mainly of:—

(i) Construction of smaller earth dams.

(ii) Protection of arable lands by contours, storm drains, etc.

(iii) Bush clearing and fire breaks.

Quantitative reports have already been given on these works.

(b) **Workshops**

The Workshops organization proved of great assistance to the Field Groups, not only in the execution of major repairs, but also in speedy attention to breakdowns in the field. In this respect, valuable assistance was given by the Mechanical Engineer, who carried out regular inspections of the whole mechanical organization, and gave advice on improvements.

There is no doubt that there is room for considerable improvement—too many minor faults were revealed by the Mechanical Engineer for the position to be considered entirely satisfactory. It is hoped, by instituting a system of written field reports, which, in turn, will require action reports, that many of these faults will be eliminated.

A considerable burden was imposed on the Workshops by the proposal to hand over certain machines to the Public Works Department. This required speedy action in bringing the tractors into a transferable condition, and these machines, of course, will need to be kept in that condition.

A good deal of work was done on attempting to solve the overheating of the VR 180 tractors. So far, in spite of consultations with the agents, we have not been successful, and this was the major factor militating against the usefulness of this type of machine.

Housing at the Workshops gave a good deal of concern, particularly for Africans. The Public Works Department is, however, shortly to commence construction on African single quarter accommodation. Water supplies also threatened to fall short of requirements, but a borehole was successfully drilled, and should be in operation soon.

Stores. Owing to the diversity of equipment, and possibly, to previous absence of financial restrictions, the holding of spares, etc., in the Stores had reached the rather excessive value of about £40,000. A detailed stocktaking was carried out at the end of June. It was noted that some of the spares and other consumables were some years old. It has accordingly been ruled that, within reason, only immediately required items will be purchased, and every effort made to reduce stock. Requisitions are also scrutinized each week, and recent purchases have been reduced from a previous average of about £1,200 per week to about £700.

(c) **Advisory Work**

In the four months under review, approximately 50 visits were paid by the Senior Conservation Engineer to various farmers, usually in company with Conservation Officers. Advice was given on:—

(i) Siting, pegging, construction and maintenance of earth dams.

(ii) Layout of spray irrigation and pumping schemes.

(iii) Construction of reservoirs and furrows.

(iv) Water supply.

(v) Road drainage.

One of the major problems encountered was on maintenance of earth dams. Generally speaking, farmers (no doubt at the instigation of Conservation Officers) were very conscientious about grassing of embankments, but spillway protection can be improved, and very little downstream drainage has been done. Most dams were well sited and built, but there was a tendency to allow earth spillways on excessively large catchments, and to use too heavy material on the outside faces of dams.

A pamphlet was issued on the maintenance of dams. A specification for the construction of weirs was also drawn up in conjunction with the Chief Conservation Engineer.

(d) **Administration**

Contact was established with the Natural Resources Board, and with the Department of Water Development and Irrigation. An agreement was entered into with the latter Department in regard to the relationships between the two Departments, as a result of which there should be close liaison in the future. Under this agreement, the Conservation Department will build dams up to 22 feet high, those above 15 feet under Water Development and Irrigation advice. Advice has already been given on three dams.

A new costing system for the Working Account to control the operation of the tractor groups has been instituted. Under this system, each individual tractor will be accounted for separately. Close contact has been maintained with the Sub-Accountant in operating the system, which is now getting well under way. It is unfortunate that a good deal of paper work is now required from field staff, but there has been an encouraging response in this connection from the men concerned.

6. ANIMAL HUSBANDRY

General. In all branches of Animal Husbandry there was a tremendous demand from the farmers for advice and assistance.

The importance of improving the present level of feeding and management was recognized and formed the basis of most advice given.

Dairying. The number of registered milk producers increased to over 120. Registered producers were entitled to receive a subsidy at the rate of 9d. per gallon of milk sold.

Producers were encouraged to improve their buildings and equipment by the Dairy Production Assistance Scheme which offers a bonus of 3d. per gallon for employing improved dairying methods and cattle feeding and a further 1d. per gallon for mechanically cooling the milk to below 45° F. Eligibility for the bonus was determined by inspection of the premises and cattle and not on the quality of the milk. Approximately 35% of the producers qualified for full bonus.

Much advice was sought on the design of dairy premises and modifications to existing layouts, so as to enable producers to qualify for bonus.

The poor quality of much of the stock imported under quota from the Union of South Africa was commented upon by the representatives of both the Friesland and Jersey Breed Societies.

Beef Production. The Good Cattle Production Bounty was administered by the Veterinary Department except for the final authorization of payment which was made by this Department. The number of cattle which qualified for Bounty showed a steady annual increase and over 20,000 head were eligible this year. The bounty entitlement is regarded as a credit against capital development and the purchase of fencing materials is by far the greatest single item purchased.

The Cattle Loan Scheme set up by the Northern Rhodesia Government was well received by the farmers, many of whom obtained an initial issue of 25 head of female stock.

There was a shortage of good ranch bulls in the country, and owners of good type Afrikander herds have been encouraged to set up small select herds capable of breeding useful ranch bulls.

The indigenous native breeds, particularly the Angoni, are being encouraged in areas where the farms are undeveloped, and the mean annual temperature high.

The Boran is being used in field scale trials organized by the Veterinary Department and the first cross progeny of the bulls are outstanding. It will be interesting to study the second and third generation to see what results are obtained.

Pig Production. During the year there was a marked change over from Large Black to Large White or Landrace pigs, brought about by the opening of a bacon factory in Lusaka, and a switch from pork to bacon caused the producers to consider the quality of their products and long light shouldered breeding stock was being selected. There was an increase in the number of pig producers and this should result in greater production next year.

Dr. Calder of the Pig Industries Control Board visited certain areas of Northern Rhodesia in May. His visit was much appreciated by all concerned.

Poultry. The importation of day old chicks continued at a high level. Interest was shown in dressed poultry production which will probably offer a firmer market than egg production.

7. EXPERIMENTAL-DEMONSTRATION FARMS

The Department has under its control the following Experimental-Demonstration Farms:—

Msekera, Fort Jameson. This farm served a most useful purpose and will play an increasingly important part in the rehabilitation and development of the Fort Jameson area. Valuable information was obtained from carefully controlled tobacco trials carried out in collaboration with the Tobacco Research Board of Rhodesia and Nyasaland. Steps were also taken to bring about planned development of the farm so that it will demonstrate effectively to local farmers not only correct land-use in the area but also up-to-date methods of stock, crop and pasture management.

Kambowa, Broken Hill. This farm too is serving a useful purpose. It was divided into two separate sections, one dealing specifically with horticulture and the other with dairy, crop and pasture production. Both sections are being developed as rapidly as possible and there is no doubt that they will prove of very great assistance in the very near future to the numerous farmers and others opening up and developing small holdings on the Copperbelt.

Chalimbana, Lusaka. The future of this farm has not yet been finalized and must await a decision from the Northern Rhodesia Government on the future use for settlement, tenant farming or other purposes of the area in which it is situated. In the meantime expenditure was kept to a minimum and minor improvements in management and other practices introduced.

Mochipapa, Choma. In this case too future policy has not yet been decided. Because of this and the resignation of the Farm Manager little more could be done than maintain the status quo.

8. VISITS OF IMPORTANCE

On several occasions the Hon. the Minister of Agriculture toured farming areas for the purpose of familiarizing himself with local farming conditions, progress and problems. He was accompanied by officers of the Department, members of I.C.A. Committees and at times the Chairmman of the Natural Resources Board.

Visits to various parts of the Territory were also paid by Dr. J. C. Ross, Secretary-General of the Southern African Regional Committee for the Conservation and Utilization of the Soil, by Professor Davies, Head of the Faculty of Agriculture of the University College of Rhodesia and Nyasaland and by members of the Southern Rhodesia Gwebi-Hunyani I.C.A. Committee.

Numerous officers of the Department also visited Research Stations and attended courses in Southern Rhodesia.

CONCLUSION

In conclusion I would like to express my particular thanks and appreciation to all members of my staff both in Southern and Northern Rhodesia for their loyal support and hard work during the year—at times under extremely difficult conditions. Due to staff shortages and the additional work resulting from the federalization of non-African Agriculture in Northern Rhodesia their burden was a heavy one. I am also indebted to the I.C.A. Committees for their generous support and enthusiasm and to our farmers who it is our duty and privilege to serve to the best of our ability.

The Department received most valuable co-operation and assistance from the Director and staff of the Department of Research and Specialist Services and other Departments of the Ministry, the Director and staff of the Tobacco Research Board of Rhodesia and Nyasaland and from the Directors and staff of the Northern Rhodesia Departments of Agriculture, Veterinary Services and Water Development and Irrigation. All this helpful co-operation was of very great value to the Department and I am most grateful to all concerned.

To the Natural Resources Boards of both Southern Rhodesia and Northern Rhodesia from whom the Department received so much assistance and co-operation I wish to extend my grateful thanks and appreciation. Likewise I am appreciative of the support received from the Rhodesia National Farmers' Union and the Rhodesia Tobacco Association.

There is no doubt that little would have been achieved without all the assistance and co-operation referred to above.

C. A. MURRAY,
Director of Conservation and Extension.

REPORT OF THE DIRECTOR OF VETERINARY SERVICES FOR THE YEAR ENDING 30th SEPTEMBER, 1956

Staff

The authorized establishment of professional officers (Field and Research) was increased from 27 to 36. Unfortunately, however, there were 13 vacancies, i.e. 9 in the Field and 4 in the Research branches as at the 30th September, 1956. Vacancies were advertised during June simultaneously the Assistant Director of Veterinary Services (Field) whilst on overseas leave, endeavoured to recruit personnel. The result was disappointing, only four appointments were made and the officers will arrive early in the coming Agricultural year.

At the end of the year the vacant post of Assistant Director of Veterinary Services (Research) was advertised.

In accordance with the recommendations of the Commission of Inquiry into Human and Animal Trypanosomiasis, authority was also granted for the formation of a special Trypanosomiasis Control Unit of 3 professional officers and 10 Animal Health Inspectors.

Of the present professional staff, 8 originate from Southern Rhodesia, 3 from South Africa and 12 from the United Kingdom.

Owing to the fact that there is a world shortage of Veterinarians, a scheme should be devised whereby encouragement is given to young Rhodesians to take up Veterinary science as a career thus eliminating the chronic shortage.

New appointments were 2 (Field 1 and Laboratory 1).

Resignations were 3 (Field 1 and Laboratory 2).

It was hoped that private Veterinary Practitioners operating on their own or under the Government Assisted Scheme would materially reduce the calls on professional staff, this, however, did not materialise. Indeed as a result of conditions brought to light by the practitioners it has necessitated more investigations both by the Field and Research branches. The farming community are demanding more cover both from the practitioner and the Government and it is evident that specialists on particular subjects are urgently needed.

It is pleasing to record that the problem of the wastage in lay staff presented little difficulty during the year. Authority was granted to establish 6 Supervisory Animal Health Inspector's posts, whose duties are the supervision of Animal Health Inspectors, laying down organized patrols etc., consequently taking a considerable amount of routine administrative duties off the District Veterinary Officer.

Despite the difficulties recorded, it is pleasing to note that as a result of the willing co-operation and hard work of the staff, the general satisfactory control of diseases was maintained and that no serious unfortunate consequences have resulted.

Tick-borne Diseases. As a direct result of fewer outbreaks of major diseases in the country, the inspectorate staff were able to undertake more regular inspection of cattle under the Cattle Cleansing Act, consequently tick control was more satisfactory and the incidence of tick-borne diseases reduced accordingly. When considering tick-borne disease, the first that leaps to the mind is African Coast Fever and its closely allied disease known in Southern Rhodesia as Theileriosis. It is pleasing to record that no outbreaks of the former have occurred since March 1954, and that although an increase in the incidence of Theileriosis was noted, the mortality was less.

Intensive supervision continued throughout the year in the Native districts of Chipinga and Melsetter where African Coast Fever in the past gave so much trouble.

It is clear that continued vigilance and control of the tick population is essential if the cattle industry is to progress and disease kept under control. Other less spectacular tick-borne diseases such as Piroplasmosis, Anaplasmosis and Heartwater take a vast and unnecessary annual toll of cattle. It is amazing in any informed country like this that tick-borne diseases should continue to be responsible for so many deaths in spite of the mass of information and advice that is so readily available, including practical demonstrations on how to prevent such diseases. It can be argued that the Department responsibility should end with the major diseases but that is not the case. We cannot at this stage be content to sit back and watch cattle die from tick-borne non scheduled disease; it is our responsibility to such farmers neighbours and to the industry as a whole to step in and control such diseases.

The introduction of many efficient tick destroying agents should have made the stock-owners burden much easier, however, it is found through lack of knowledge and failure to obtain advice that the postion in regard to tick control has in fact deteriorated through the continued misuse of acaricides. It is also recorded that there is a gradual swing back to the old stand-by, viz.; arsenical dips.

It is clear that this Department must take very energetic action in the way of propaganda measures in order to educate the stockowner in tick control. Spray races have gained in popularity but it must be emphasized that European supervision is essential for successful tick control.

Trypanosomiasis. During the year a total of 47,126 head of cattle has been treated; the total number of confirmed cases dropped to 198.

The overall picture gives a feeling of sober satisfaction. A steady improvement is recorded from all infected districts with the exception of the Lupani Native District where infection was detected at a further seven centres and 76 confirmed cases were recorded as against 10 the previous year.

This Department's main responsibility lies in the detection and treatment of the disease, the preventive aspect also engages our energies mainly through the Trypanosomiasis Committee and the erection of cattle fences to contain cattle. Treatment with Dimidium bromide, of infected and incontact cattle has been the method of choice, although an extensive field trial using Antrycide pro-salt was undertaken and still is being carried out in one particular area involving some 17,000 head of cattle.

In the area where the Antrycide pro-salt is used the cattle are being inoculated at three months interval and to date trypanosomiasis has not been detected in any animal so treated.

Following upon the initial treatment of cattle, with the pro-salt at the dosage rate recommended by the manufacturers, a total of 179 head succumbed to the effects of the drug. On being advised of this mortality the manufacturers sent two specialists to investigate. Their findings were to the effect that under the conditions prevailing in this country a reduced dose must be used. Since then continued treatment has given rise to no adverse effect.

At the same time as the cattle mentioned above were being initially treated with Antrycide some 5,797 head were treated, elsewhere, with Dimidium bromide and there were 322 deaths directly due to photo-sensitization. The latter drug has been used in this country since it was placed on the market, without adverse effects and has continued to be used successfully. No satisfactory explanation can be given as to why the drug should have caused this phenomenon.

A game fence in the Mtoko district was completed and a cattle fence in the Mtoko and Mrewa district was also completed. In the Sebungwe district the first portion of the cattle fence was completed. In the Bikita and Ndanga districts work on a game fence is in progress.

Rabies. A total of 52 cases of rabies was confirmed during the year and unfortunately two were human. This is 48 less than in the previous year. The cases were recorded in 21 districts, showing how widespread the foci of infection are. Three of the confirmed cases were in vaccinated dogs.

Once again it is repeated that vaccination is only an adjunct in the control of rabies, albeit a very useful one, when combined with other measures such as quarantine, destruction of strays and confinement where called for. To eliminate the disease full public co-operation is the first essential in producing dogs for vaccination, destroying strays and giving heed to tie-up orders. There was provision for 3 Canine Destruction Units on estimates but unfortunately it is impossible to acquire suitable men for this work; few last for two months, their duties ostracize them from their fellowmen.

The Department is doing its utmost to eradicate the disease but without full public support it is clear that the condition will be with us for some years.

Since vaccination commenced a total of 528,537 dogs has been vaccinated, no mean task.

Tuberculosis. Much work, with very gratifying results has been done over the year on tuberculin testing of dairy herds and a few large ranches. At the end of the year there were 308 herds under test comprising 23,743 head of cattle. There are 5,401 head more under test than last year. A total of 58 reactors was revealed. These figures do not include the cattle tested on a large ranch, which are given later.

During the year Government introduced a compensation scheme whereby compensation was payable if there were 5% or more reactors in a heard. So far only 7 herds have come under the scheme.

Good progress has been made in eradicating tuberculosis from a large ranch in Matabeleland. Of 15,601 European-owned cattle tested 129 reacted (.82%) and in the Native-owned cattle 1,636 head tested, 15 proved positive (.9%). For economic reasons all reactors are segregated on a separated block of ground but straying does occur and consequently infection is re-introduced to the clean herds. The management of the ranch are co-operating as much as possible and extensive fencing programmes have been put in hand.

The Department is highly satisfied with the progress made in tuberculosis eradication but very much more work is still to be done. The eradication of tuberculosis in dairy herds should go hand in hand with any scheme for the eradication of the disease in man.

Foot and Mouth Disease. The country has been comparatively free from this condition. Only one small outbreak involving 6,261 head occurred early in November, 1955. The virus was typed at S.A.T.2. The first phase of the Foot and Mouth disease fencing programme, that is a 70 mile fence running between the Turgwe and the Mtilikwe Rivers along the southern boundary of the Ndanga Native Reserve, was completed and the second phase, from the Ndanga Native Reserve running south and then south-easterly to the Chiredzi River, was nearing completion at the end of the year. Maintenance of the first fence has cost little but it is obvious that maintenance of the second portion will be heavy in the near future, on account of damage by large game.

It is hoped that the fences will prove their value in controlling the spread of Foot and Mouth disease in this area.

Agalactia. In the early part of the year this condition in swine, in the Fort Victoria District, gave cause for anxiety. No cases have been recorded since June, 1956. The condition has been given a considerable amount of publicity in the farming press, with the result that almost every pig breeder maintains cases are prevalent. Investigations, however, reveal the presence of mastitis, metritis and other febrile conditions which produce a lowering in milk yield. To date, all investigations, including feeding experiments, have been negative.

There is, however, no evidence to disprove the early contention that the causal factor is contained in certain batches of food which appear to upset the endoctrine system thus suppressing milk secretion.

Contagius Epididymitis and Vaginitis. At the end of the year a total of 150 properties was in quarantine, an increase of 15 over the previous year. From this it would appear that the general position has deteriorated, which in fact is not the case. Indeed, owing to the work done on infected properties the fertility rate has increased greatly. During the year, milk surpluses were evident and such surpluses have exercised the minds of the people concerned as to disposal.

Some five years ago the Department promised increased veterinary service to the dairy farmer and it is considered that this cover has helped to keep production abreast of the growing demand for milk through the increased tempo of immigration.

During the year Professor Rasbech of the University of Copenhagen, Denmark, spent three months in the Colony investigating our infertility problems. He is a specialist on bovine infertility and his report is awaited with great interest. The services of this eminent personage were obtained through the Food and Agricultural Organization, Rome.

During the year, two other diseases were confirmed, Vibriosis and Trichomoniasis. At this stage it is impossible to state just how widespread these conditions are.

Further testing for Rift Valley Fever and Wesselsbron virus was undertaken and it appears that both are to be found in a number of herds. Both conditions are associated with abortion in cattle.

Meat Inspection. A perusal of the statistics in the report from the field branch reveals that at the Cold Storage Commission works and at Liebig's Canning factory there was a considerable drop in the slaughter figures.

During the year 139,545 cattle, 67,971 pigs, and 12,199 sheep and goats were slaughtered. The corresponding figures for the previous year were 165,936 cattle, 80,118 pigs, and 13,524 sheep and goats. In view of the increased population the drop in slaughterings is not understood unless it is due to consumer resistance.

Research. At the end of the year only two professional Veterinary Officers were attached to this branch. It was with great difficulty that the diagnostic service was maintained and the experimental work on low fertility and parasitism was kept up.

In connection with the latter condition it is recorded that at present Dr. Le Roux of the School of Tropical Medicine, London, is making a survey of Internal Parasites of stock throughout the Federation. The assignment is under the auspices of the Food and Agricultural Organization.

Conferences. The following conferences were attended by the Director of Veterinary Services:—

1. Inter African Bureau of Animal Diseases, at Pretoria.
2. Food and Agricultural Organization Conference on Tick-borne Diseases at Rome.
3. I.S.C.T.R. Conference on Tsetse and Trypanosomiasis, at Salisbury.

The Assistant Director of Veterinary Services (Field) attended the following conferences whilst on leave in the United Kingdom:—

1. Third International Congress on Animal Reproduction, at Cambridge.
2. Conference on the use of drugs for the control of Animal Trypanosomiasis, at London.

The Department, in all its branches, put in a very full year's work and my thanks are due to the staff for the conscientious manner in which they performed their duties.

The usual willing co-operation with other officials of the Service especially Health, Native Affairs, Police, Law, Tsetse Operations and the Rhodesia National Farmers Union are very much appreciated.

J. MacKINNON,

Acting Director of Veterinary Services.

REPORT OF THE ASSISTANT DIRECTOR OF VETERINARY SERVICES (FIELD) FOR THE YEAR ENDING 30th SEPTEMBER, 1956

Staff

Assistant Director of Veterinary Services (Field): Mr. J. MacKinnon.

District Veterinary Officers: Messrs. J. W. Nixon, T. L. May, J. W. Williamson, H. M. Hodkin, J. Ross, A. E. Gillespie.

Senior Veterinary Officers: Messrs. R. W. Bryson, A. D. Hurrell, J. E. Robinson, W. P. Boyt, A. Wilson.

Government Veterinary Officers: Messrs. J. D. Adamson, V. A. D. Browne, E. V. Cock, P. J. Hannan, H. R. Thorogood, J. A. Lawrence, W. A. Mundy, J. L. M. McCulloch.

In all 20 Field Veterinarians. The approved Field Establishment at the end of the year being 29, an increase of seven over the establishment for the previous year but unfortunately the vacancies, nine in number, have not been filled.

New Appointments: Mr. J. A. Lawrence, on the 25th August, 1956. This officer, a Rhodesian by birth, was appointed immediately he qualified.

Resignations: Mr. A. MacGilp.

Mr. H. K. Hesketh, who was for a number of years, District Veterinary Officer, Umtali, died during the year. It is with great regret that his loss is recorded.

Animal Health Inspectors. The approved Establishment was increased during the year from 68 to 78. The year began with a shortfall of three and ended with a shortfall of seven.

New Appointments: Eight.

Resignations: One. Discharges: One.

The annual wastage recorded in previous years was notable by its absence and it is hoped that the more promising new recruits will not be lured away as in the past, to farming, where prospects are better and conditions more congenial.

Meat Inspectors. The Department only undertakes the inspection of meat at the Cold Storage Commission Abattoirs at Bulawayo, Salisbury, Fort Victoria and Umtali, and also at Liebigs Factory, West Nicholson.

The approved establishment to undertake this duty is 15 inspectors who hold the dual qualifications of Sanitary Inspector and Meat and Other Foods. The year began with one man short and ended with a shortfall of two.

Resignations: Two. Appointments: One.

Difficulty is experienced in recruiting personnel for this work.

Clerical Staff. Here again the Department has been at a disadvantage in as much that although the authorized establishment is 11 only two are on the permanent staff, the others are employed in a temporary capacity.

Accommodation. Little progress can be reported in this respect, in as much that no provision was allowed on estimates for either Offices or Quarters. However, it is pleasing to record that the first phase of the erection of the quarantine station at Plumtree was completed.

In view of the housing shortage in towns and lack of quarters on outstations, difficulty was experienced in transferring suitable officers where their services were most required.

Transport. A pronounced improvement is recorded in this respect. This improvement was due, in the main, to the fact that more Field Officers used their private vehicles on official duties. Loans of up to £850 were made available to individual officers to purchase suitable vehicles. Only vehicles of 16 h.p. or over are approved, for field use. By the end of the year 90% professional officers and 65% Animal Health Inspectors were using private vehicles on Government duties.

During the year under review, a total of 180 man-days was lost (Professional Officers 17 and Animal Health Inspectors 163) as compared with 333 and 1,115 the two previous years.

General

Rainfall. General rain set in during November having been preceded by high temperatures and a few isolated showers. Rains continued until May in most parts and a very favourable autumn and early winter resulted. Farmers in Matabeleland and Mashonaland did however, suffer a setback in January which proved to be a dry month, in fact prospects towards the end of this month were very unfavourable regarding primarily crops, though to a lesser extent stock also. In isolated areas near drought conditions prevailed.

Fortunately good rains were recorded in February and conditions improved virtually overnight. In spite of the general high rainfall, very little winter rain fell in sections of the Eastern

Districts, where winter rains are relied upon. A general fall of between half an inch and five inches fell in early September of 1956.

Due to the good seasons that have been experienced during the last four years or so, water supplies for stock have been far above average and little difficulty has been experienced with the normal watering of cattle towards the end of the year. At present dams still contain a good deal of water and a large number of streams are still running. In spite of the good rains travelling in the outlying districts has not been interfered with by rivers to the same extent as was the case last year.

Grazing. Natural veld grazing is still relied upon to carry most stock through the year on most farms without any artificial feeding.

Increased interest is however being shown by an appreciable percentage of farmers in improved pastures and proper grazing control. With few exceptions grazing has been plentiful throughout the year and in the lowveld the quality has also been good. The dry spell in January, the late autumn rains and belated and mild frosts have all had a most beneficial effect on the quantity, and more especially the quality, of the veld grazing. During the winter extensive veld fires burned out vast grazing areas in Matabeleland although due to the comparatively high water table pertaining at present new growth was rapid. Grazing was poorer than usual in the winter rainfall areas as very little winter rain fell this year. Veld hay was mostly dry and unpalatable by the time it was cut and stacked, comparatively little urea and molasses were used by farmers to increase the digestibility of the hay. Again it is unfortunate that primarily due to the delayed rains, a large amount of Cowpea hay and also Beans were spoiled.

Condition of Cattle. Cattle maintained condition well, although the general standard in Matabeleland is considered to be slightly lower than it was last year, in spite of this the general standard throughout the country was a good deal higher than the average for the month of September. A mild winter and late autumn rains as reported above have had a beneficial effect on condition of cattle in general. Reports of poverty deaths have been very few and these reports with few exceptions refer to overstocked Native areas and neglected European owned cattle. Where extension work carried out by the Department regarding the control of verminosis is heeded, cattle have maintained their condition to a very marked extent. Weaners were mostly poor at the end of the Agricultural year; most of these are heavily infested with parasites, added to which they are weaned at the most unfavourable time of the year. In general, for various reasons, Native stock have not attained the good condition which they should have.

Tick Life. Flooded tanks and unsuitable weather for dipping was not as big a drawback to normal dipping during the rainy season as was the case last year. Fewer outbreaks of major diseases in the country enabled inspections under the Cattle Cleansing Act to be carried out more regularly than was the case last year.

Tick control has consequently been more satisfactory in that tick borne diseases have been comparatively few during the year. There has been a good deal of comment on alleged resistance of ticks to various types and makes of dipping preparations. Most of this comment is made without proof or even cause if it is appreciated that the modern organic acaricides have unavoidable drawbacks associated mostly with the fact that none of them are in a true solution.

Many complaints concerning inefficiency of dipping preparations have been investigated by the Department and in almost every case complaints have been found to be groundless. The reasons for the alleged inefficiency are usually dirty and insufficient dipping fluid, silted tanks and dipping fluids far below the recommended and required concentration.

There are many types of tick destroying agents on the market, each with its different trade and chemical name. Most of these dips are intended and prescribed for specific types of ticks, and some of them are virtually worthless against any other type of tick. As the result of a wide choice being available and in cases where advice is not sought from the Department but from less well informed sources, an unsuitable dip or combination of dips is often selected by cattle owners.

Poor results follow necessitating the seeking of further advice; often confusion and poor tick control is the end result.

Proper and correct recommendations are always given by the Department when the opportunity is possible. It is distressing to report that advice is not sufficiently sought by a good many cattle owners, a certain section of whom in the absence of an actively destructive tick borne disease, are inclined to regard any assistance with undisguised antagonism. This attitude is particularly unfortunate in that it can well lead to lack of co-operation in the reporting and control of other infectious diseases.

In spite of isolated instances of partial or complete resistance of ticks to certain dips, all species of ticks can be properly and economically controlled if dealt with correctly. During the year under review the swing back to Arsenic reported last year has fortunately continued as it has been repeatedly proved that the use of preparations such as DDT, BHC and Toxaphene, etc., (depending on local circumstances) as adjuncts to full strength Arsenical dipping fluids have given excellent control all over the country.

Spray races are slowly gaining in popularity where European supervision is possible. Good results have been obtained by the use of spray races where these have been efficiently operated and where the acaricide can be changed immediately without wastage according to circumstances.

Quarantine Notices. Bulawayo 346, Salisbury 447, Umtali 26, Gwelo 136, Victoria 52, Melsetter 80. Total 1,087, which is 312 more than last year.

Contraventions. Cattle Cleansing Act: Bulawayo 277, Salisbury 48, Umtali 32, Gwelo 19, Victoria 163, Melsetter 49. Total 588.

Animals Diseases Act: Bulawayo 205, Salisbury 36, Umtali 73, Gwelo 5, Victoria 38, Melsetter 30. Total 387.

Scheduled Diseases

African Coast Fever. The last outbreak of this disease occurred on the 10th March, 1954, on Rietvlei Farm in the Chipinga Native District. After slaughter of all cattle this farm was cordoned off and remained cattle free until May, 1956, when the quarantine was lifted and the cordon was removed and the farm was re-stocked. Intensive supervision of cattle and dipping was maintained in the Chipinga and Melsetter Native Districts. There have been no further cases of this disease.

Theileriosis. Outbreaks were confirmed as follows:—

Bulawayo	Nil	Deaths—	Nil
Melsetter	1		3
Salisbury	31		198
Umtali	8		36
Victoria	5		152
Gwelo	1		1
Total outbreaks	46	Deaths	390

The incidence of this disease was higher than last year when 29 outbreaks were recorded. Farmers are becoming well acquainted with this disease and its control.

Although the number of outbreaks has increased, the recorded mortality from the disease has decreased. No drug has yet proved effective in curing the disease, nor has any information been gained which refutes the theory that after Theileriosis the recovered animal can act as a carrier. Individual stock owners are becoming increasingly aware of its economic importance and are doing their utmost to control it. Quarantining, short interval dipping and hand-dressing continue to be the methods of control adopted.

Anthrax. There were only two minor outbreaks of this disease during the year; one in the Victoria district causing 30 deaths and another in the Umtali district where only one death was reported. In controlling the disease at these two centres 13,954 and 1,016 head of stock were inoculated respectively.

Annual prophylactic inoculations at previously infected foci were carried out as follows:—

Bulawayo 11,260, Salisbury 59,216, Victoria 650, Gwelo, 367, Melsetter 183. Total 71,676. Grand Total 86,646.

Foot and Mouth Disease. At the end of last year, the only actively infected centre was in the Buhera Native Reserve. The placing of cordons and inoculations of cattle with live virus, had been completed before October. The entire cordon was lifted on the 15th November and intensive daily supervision of infected cattle was stopped on that day. Weekly inspections of the cattle which had been adjacent to infection continued well into December and all restrictions were lifted during January.

In the Fort Victoria Veterinary District only one outbreak occurred, this being in the Dewure Native Purchase Area of the Gutu Native District. The diagnosis was confirmed on the 1st November and the causal virus was later typed as S.A.T. 2, this being the same virus that had been present in the Gutu Reserve during the early part of 1955. This outbreak was successfully confined to the Dewure Division with no extensions at all. A total of 6,261 cattle was inoculated with live virus. The usual quarantine restrictions were enforced these being lifted during early June.

The comparative freedom from this disease during the year has been most welcome, and as a result there has been no necessity to transfer staff temporarily for extended periods to the Foot and Mouth Disease Enzootic areas to assist in control, consequently more work has been undertaken in other districts.

Trypanosomiasis. In most Native districts there has been a slight improvement in the general position. A notable exception is the Lupane Native District where the situation deteriorated during the year. In the Sebungwe Area the situation has also not improved in keeping with other infected areas. The control of this disease has again received the highest priority.

The findings of the Commission of Inquiry into Animal and Human Trypanosomiasis were published. The recommendations of this Commission are not to any extent different from the methods and policy advised by the Trypanosomiasis Committee.

The disease position in the various districts is given hereunder:—

Urungwe Native District. Only one case of trypanosomiasis was diagnosed during the year on the Karoi Soldier Settlement Block. As the result of this continued improvement on the Karoi farms more confidence in the cattle industry is being shown. Farmers are however, still on the alert and especially now that there is a great amount of traffic to and from Kariba Gorge, passing through the area. The number of cattle on the original 28 infected farms at present stands at 1,307 head as compared with 1,537 head last year. Previously the figure had dropped from 3,341 when the disease was first confirmed down to 1,537 at the end of last year. There is no reason from the disease point of view why this figure should continue to drop.

Small stock continues to thrive in the Urungwe Reserve without any clinical cases or mortality having been recorded. The total number of sheep, goats, pigs and donkeys this year is 1,608 as compared with 1,256 last year.

From Entomological reports "Fly" is still being found in the western half of the Reserve with fairly heavy incidence in some of the riverine areas. Resettlement of Africans in the Reserve and that portion of the western half in the Badze Area, from the Crown Lands to the north and west of the Karoi Block has commenced under Native Department Supervision.

It is interesting to note that although all small stock have given negative blood slides, eight positive smears were obtained from dogs.

Two bait cattle at Maguinye have been regularly smeared, with negative results.

Mtoko Native District. In the Mtoko Native Reserve there are six infected dipping centres, although during the year infection recurred at only two of these centres, one case being diagnosed at each centre.

In the Chikwizo Reserve only six positive cases were diagnosed. There has been a slight increase in the cattle population in this Reserve—249 to 293.

Positive Cases.	1954/55	1955/56
Mtoko	10	2
Chikwizo	53	6
	63	8

Total inoculations = 74.

The disease position has improved tremendously in these two Reserves and keen interest and appreciation has been shown by the Native stockowners.

Mrewa Native District. Here again it is pleasing to report a spectacular improvement in the disease situation. In the Fungwe Native Reserve where infection was diagnosed in May, 1954, and where 254 cases were confirmed with a mortality of 68 head by the end of last year; there have been only five cases confirmed this year, with no confirmed deaths caused by Nagana. A total number of 3,867 head were treated.

Fencing programmes in both the Mtoko and Mrewa Native Districts have been completed. In the Mtoko Native Reserve the cattle fence runs along the north-eastern boundary preventing cattle straying into the Crown Lands to the north. The fence continues into the Fungwe Reserve and cuts off a large portion of the northern end. The cattle previously inhabiting this northern portion were removed south of the fence early in the year. It is clear that the fence has played a very important role in preventing cattle-fly contact.

Darwin Native District. Continued inspections fail to reveal the presence of infection.

Lomagundi Native District. One *G. morsitans* was caught in the Doma Block in October, 1955. There has been no infection and it is considered that this fly was probably carried by migrant labour from the Ntondongwe area.

Sebungwe Native District. During the year, four new centres of infection, namely, Kana 3, Kana 4, Kana 6 and Lubimbi, have been confirmed. This brings the total of confirmed infected centres to 17 as compared with 13 last year. A total of 43 positive cases was diagnosed as compared to 160 cases last year. In all, 4,759 inoculations were carried out.

The position here is fluid and although more centres of infection were detected, the actual number of cases showed a decrease. The fencing programme continued albeit slowly and it is obvious that it will have a decided bearing on the disease position.

Lupane Native District. A marked and serious deterioration has taken place in this area. Last year there were ten confirmed cases at two dipping areas, namely, Japiwa and Sibombo, this year there are nine infected centres with a total of 76 confirmed cases. 3,442 inoculations have been

carried out during the year, and 2,048 smears have been examined. Staff has been concentrated in this area to cope with the position.

Wankie Native District. The situation here is best described as static. There have been seven confirmed cases involving five centres. Eighty head have been inoculated.

Inyanga Native District. During the early part of the year the four infected centres in the Inyanga North Reserve were treated with Dimidium Bromide. Of the total of 5,797 head treated, 322 died presumably as the result of photo sensitization and a further 200 were severely affected, but eventually recovered. The position at present is considered to be satisfactory; no positive smears have been received since the block inoculation. One positive case was found at Holdenby, this is considered to be an isolated case as no further cases could be detected after a smear survey.

Umtali Native District. No cases have been detected in this area.

Melsetter Native District. There was only one case on a European farm in cattle, although both horses on this farm were infected. There were no cases in the Native Reserves.

Chipinga Native District. A marked improvement has taken place here, which can be ascribed to both the establishment of gates where all traffic is checked for "Fly" and where vehicles are sprayed with insecticides, and to the use of Antrycide Pro-salt which has both a curative and prophylactic effect. The use of Antrycide Pro-salt has proved most effective; it has however, to be used with extreme care as toxic effects following its use have been observed. 179 deaths were the direct result of Antrycide therapy after the first block inoculation of 13,517 head of cattle. A slightly reduced dosage has since proved to be both effective and safe.

The total number of cattle inoculated was 27,410 in the Native areas, and there were only eight cases of trypanosomiasis this year as compared with 157 cases last year. A total of 757 smears was checked. On the European high veld there were 11 infected premises with a total of 22 cases.

The area of bush clearing on the highveld has been increased and the shooting area has also been increased in the lowveld Native area.

Ndanga Native District. In the Ndanga East Reserve the situation has again been far from satisfactory although there was an improvement toward the end of the year as the result of restricted movement of cattle towards the south. There were 24 confirmed cases.

Bikita Native District. In the Sangwe Reserve two positive cases were confirmed and on a ranch nearby, one case. From the Ndanga East and Sangwe Reserves together a total of 27 cases was confirmed—1,687 cattle were treated.

During the year 47,126 head of cattle have been treated; there have been 198 confirmed cases in stock and 23,028 blood films have been examined. In addition, seven cases have been confirmed in dogs—this figure in dogs is not included in the above.

Rabies. The following cases were confirmed during the year:—

Native District	*No. of Cases*	*Date Last case*	*Species*	
Belingwe	2	2.8.56	Dog	N.V.
Bikita	—	—	—	
Bubi	1	27.6.56	Dog	N.V.
Buhera	—	—	—	
Bulalima Mangwe	1	10.10.55	Dog	N.V.
Bulawayo	—	—	—	
Charter	—	—	—	
Chibi	2	15.9.56	Dog	N.V.
Chilimanzi	1	6.2.56	Human	
Chipinga	—	—	—	
Darwin	3	4.9.56	1 Human	
			2 Dogs	N.V.
Goromonzi	3	16.6.56	3 Dogs	N.V.
Gutu	—	—	—	
Gwanda	1	10.9.56	Bovine	
Gwelo	1	7.10.55	Dog	N.V.
Hartley	1	19.11.55	Dog	N.V.
Insiza	—	—	—	
Inyanga	1	5.6.56	Dog	Vac.
Lomagundi	—	—	—	
Lupane	—	—	—	
Makoni	1	17.10.55	Dog	N.V.
Marandellas	3	16.6.56	1 calf	
			2 dogs	1 N.V./1 Vac.
Matobo	—	—	—	
Mazoe	10	10.9.56	10 dogs	N.V.
Melsetter	—	—	—	
Mrewa	3	4.6.56	3 dogs	N.V.
Mtoko	2	28.5.56	2 dogs	N.V.

Native District	*No. of Cases*	*Date Last case*	*Species*	
Ndanga	4	8.9.56	4 dogs	N.V.
Nuanetsi	—	—	—	
Nkai	—	—	—	
Nyamandhlovu	4	25.8.56	4 dogs	N.V.
Salisbury	—	—	—	
Sebungwe	—	—	—	
Shangani	—	—	—	
Selukwe	1	4.6.56	1 jackal	
Umtali	4	6.4.56	1 jackal	
			3 dogs	2 N.V./1 Vac.
Urungwe	—	—	—	
Victoria	2	22.8.56	2 dogs	N.V.
Wankie	1	4.10.55	dog	N.V.
Wedza	—	—	—	

Results according to species:—

Canine	46
Feline	nil
Bovine	2
Jackal	2
Pig	nil
Human	2
TOTAL	52

This is 48 cases less than last year. Total cases confirmed since outbreak 768. Three dogs which had been vaccinated developed the disease. Although there has been an appreciable drop in the number of positive cases it is disappointing to note that this reduced number of cases has occurred in 21 different Native Districts, making it evident that active foci of the disease are still present.

The control of this disease is difficult as it is spread over such a wide area. The public are most apathetic about control, except after a scare or the death of a human being. Maintaining a high standard of immunity in Native areas is difficult in that there is, with few exceptions, a new generation of dogs every 18 months. The average life span of a dog in a Native area is estimated to be not more than 18 months, which shows how difficult it is to maintain a full blanket of immunity.

During the year 84,221 dogs were vaccinated or re-vaccinated throughout the country, making the grand total 528,537 since vaccination first commenced in 1951.

Tuberculosis

A. Importations—Total tested, 1,475. Reactors, 2.

B. Exportations—Total tested, 3,294. Reactors, 9.

C. Umtali Eradication Scheme—

Scheme A.	Number of Farms	5	
	Number of cattle	651	
	Number of reactors	1	
Scheme B.	Number of Farms	3	
	Number of cattle	897	
	Number of reactors	4	(in 1 herd)

D. Voluntary Scheme—

Umtali	Number of herds	35
	Number of cattle	1,781
	Number of reactors	nil
Bulawayo	Number of herds	69
	Number of cattle	4,905
	Number of reactors	21
Salisbury	Number of herds	141
	Number of cattle	11,930
	Number of reactors	17
Gwelo	Number of herds	25
	Number of cattle	1,670
	Number of reactors	8
Melsetter	Number of herds	23
	Number of cattle	1,345
	Number of reactors	nil

Compensation Scheme Tests—

Bulawayo	Number of herds	3
	Number of cattle	216
	Number of reactors	7
Salisbury	Number of cattle	273
	Number of herds	2
	Number of reactors	nil
Melsetter	Number of herds	2
	Number of cattle	75
	Number of reactors	nil
Compulsory Tests	Number of herds	1
	Number of cattle	50
	Number of reactors	nil
Total number of cattle under test		23,743
Total number of herds under test		308
Total number of reactors during the year		58

(This does not include the Compulsory test).

It will be noted that there are 99 more herds under test, than last year, bringing a further 5,401 cattle under regular test.

The Compensation Scheme referred to in the Annual Report for 1954-55 has recently been open to the Public and seven herds are now tested under this new agreement. There appears to be no apparent reason why this scheme should not be popular and it is hoped that owners of herds which were tested on the original voluntary scheme will join the new compensation scheme. Credit is due to those dairy farmers and stockowners who have commenced regular testing.

The fact that such a high percentage of dairy stock in the country is under regular test and can for practical purposes be regarded as free from tuberculosis is a noteworthy achievement. Here a word of caution is necessary. During the past Agricultural year there were no major outbreaks of disease so that professional staff were able to devote a large amount of their time to tuberculosis control. Even under these favourable circumstances it is clear that the present staff were working to a full capacity on tuberculosis.

It was not necessary to bring any new herds under a compulsory testing scheme, which is normally done to safeguard public health, where active infection is known to exist. The one herd tested on a compulsory basis last year has revealed no reactors this year. The second herd referred to last year, due to a high incidence of disease, was slaughtered out.

Good progress has been made in eradicating tuberculosis from a large ranch in Matabeleland. In the annual test 15,601 European-owned cattle revealed 129 reactors (.82%) and in the Native cattle 1,636 animals tested showed 15 to be reactors (.90%). This is an appreciable improvement over last year's figures when infection percentages were 2.1% and 1.0%. Straying of infected isolated cattle still takes place although to a lesser degree and it is intended to slaughter infected cattle instead of isolating them this coming year, to a far greater extent than has been economically possible in previous years. It is very gratifying to be able to record this sound progress after years of hard work. In the early part of the year it was necessary to perform a number of retests and to test also additions such as calves. In all 22,069 tests were done during the year on this ranch, which gave 325 reactors (1.4%).

Incidence of this disease appears to be appreciable on a ranch in the south of the country, post mortem examinations at abattoirs and a limited number of tests on the ranch confirm this. It is regrettable that it has not been possible to start an eradication scheme here also.

Meat Inspection Incidence—

Cold Storage Commission, Bulawayo	Bovine	23	Porcine	68
„ „ „ Salisbury	„	42	„	18
„ „ „ Fort Victoria	„	14	„	nil
„ „ „ Umtali	„	5	„	26
Canning Factory, West Nicholson	„	186	„	nil
TOTALS	„	270	„	112

Heartwater. Cases confirmed as follows:—

Bulawayo 17, Victoria 9, Melsetter 2.

There was a large number of suspected cases in Matabeleland, numbering 226. These figures do not give a true picture—most stock owners are acquainted with the disease in the adult animal and do not report cases. It is clear that there are many deaths in calves and young stock in the enzootic area.

Diagnosis of Heartwater in calves is difficult for the layman and it is estimated that a good many calves died of Heartwater but their deaths are ascribed to other causes. On several small ranches in Matabeleland, losses of between 10% and 15% of calves and young stock has been reported. One must assume that mortality also occurs in Native areas to a lesser extent. Treatment with Sulphonamide drugs or Anti-biotics gives good results. The extremely short keeping quality of a vaccine, a matter of hours, together with present lack of facilities, make vaccine production impossible at present.

Immunisation with a fresh blood vaccine made by a private veterinarian continues to give satisfactory results on a ranch in Matabeleland. This vaccine production and use is successful as it is prepared on the ranch and can thus be obtained on the required days and injected within a matter of a few hours.

Piroplasmosis. Confirmed cases were as follows:—

Bulawayo 42, Victoria 19, Salisbury 41, Gwelo 28, Umtali 19, Melsetter 39. Total 188.

Here again it can be stated that the figures are out of proportion to the actual number of cases. The disease is well known to the stockowner and owing to the number of reliable remedies, stockowners undertake their own treatment without reporting the incidence of the disease.

Quarter Evil. Outbreaks confirmed as follows:—

Bulawayo . .	141 outbreaks . . .	517 deaths
Salisbury . . .	53 outbreaks . . .	216 deaths
Fort Victoria .	9 outbreaks . . .	70 deaths
Umtali . . .	29 outbreaks . . .	83 deaths
Gwelo. . . .	19 outbreaks . . .	29 deaths
Melsetter . . .	5 outbreaks . . .	13 deaths

The above figures represent only a small percentage of the number of deaths which must have taken place. Effective vaccines are sold by private firms and by the Department so the control of this disease is obviously in the hands of the stockowner himself. Mortality from Quarter Evil must therefore be primarily ascribed to procrastination and to a lesser extent, ignorance.

Only one case of Malignant Oedema was confirmed in Matabeleland.

Contagious Epididymitis and Vaginitis. During the year new centres of infection were confirmed as follows:—

Bulawayo 20, Salisbury 16, Gwelo nil, Fort Victoria 6. Total 42.

Releases from quarantine were:—

Bulawayo 6, Salisbury 12, Fort Victoria 6, Gwelo 1, Umtali 2. Total 27.

In quarantine at the end of the year:—

Bulawayo 35, Salisbury 91, Fort Victoria 17, Gwelo 7. Total 150.

This is an increase of 15 over the total for last year. In spite of this increase in figures the position seems to have improved in that on infected properties the fertility rate has improved. Research work carried out in this and neighbouring countries infected with the disease, has revealed nothing new on this difficult disease subject, so that the Department has been obliged to rely on the general principles of disease control which have been practised here and elsewhere since the disease first made its appearance in Southern Africa, over 10 years ago.

Professor Rasbech, an international authority on infertility in animals, is at present in Southern Rhodesia investigating the various causes of this condition and his report should prove of great value and interest.

Contagious Abortion. Infection was confirmed on premises as under:—

Bulawayo 22, Salisbury 48, Umtali 30, Gwelo 22, Fort Victoria 3 and Melsetter 28. Total 153.

6,171 blood samples were submitted giving 482 reactors

As yet not enough use is made of S.19 vaccine, although there is a steadily increasing demand for it. There is unfortunately a good deal of misunderstanding regarding the use of this vaccine. It is not curative, and its use does for a short period at least cause the normal blood test to give a positive reaction in a disease free animal. This unfortunate fact does lead to a good deal of general misunderstanding in spite of efforts of the Department to correct these impressions. Greater use of vaccine could do a great deal to increase calving percentages.

Sheep Scab. A total of 6 infections was recorded in sheep and goats and these were suitably dealt with. Scab is enzootic in most Native areas; it crops up in isolated centres periodically and is dealt with by the usual method of dipping.

Senkobo Skin Disease. An undetermined number of cases was noted in the Wankie, Lupane and Sebungwe districts where this condition normally occurs, as the result of transmission by the variegated bont tick. A slight increase in the number of infected cattle was noted in the Wankie Native District.

Lumpy Skin Disease. Noteworthy outbreaks, involving a high percentage of cattle, were limited to two in Matabeleland and one in Mashonaland. From all other Veterinary districts mild and isolated cases have been reported, usually involving no more than one or two individual animals.

Scheduled Poultry Diseases

Spirochaetosis. There were only two confirmed outbreaks, with light mortality. A further three outbreaks were suspected but were not confirmed.

Coccidiosis. This disease is widespread throughout the country. Most poultry farmers recognize the condition and deal with it themselves by correcting hygiene and by the use of proprietory medicines.

Fowl Typhoid.

Bulawayo . . .	6 outbreaks
Salisbury	16 outbreaks
Melsetter	4 outbreaks
Fort Victoria . .	2 outbreaks
Umtali	6 outbreaks
Gwelo.	1 outbreak
TOTAL . .	35 outbreaks

Mortality figures were low. Proprietory medicines were used to control deaths after which birds were tested and carriers and infected birds were slaughtered. Native owned fowls which are brought from Reserves on to European premises are a constant source of infection.

Bacillary White Diarrhoea. A total of 202 B.W.D. free certificates was issued, which is an increase of 54 as compared with last year. 130,942 birds were tested. Infection was present on 17 premises. Positively reacting birds were immediately slaughtered. The annual testing of this large number of birds demands many hours of work from the field staff.

Fowl Cholera. Only 4 outbreaks occurred, the resultant mortality was not high except in one case. These 4 outbreaks were in small flocks and only 620 birds had to be slaughtered and burned.

Newcastle Disease. There were no outbreaks of this disease during the year.

Chicken Pox and Roup. A large number of outbreaks occurred in all areas, these mostly involved small flocks which are kept solely for the owners use.

Non-Scheduled Diseases

Anaplasmosis. Cases have been confirmed as follows:—

Bulawayo 54, Salisbury 51, Gwelo 14, Victoria 19, Umtali 20, Melsetter 103. Total 261.

This figure represents only the confirmed cases and must be a very small percentage of the actual number of cases which have occurred.

Paratyphoid. Only 5 centres of infection were confirmed. A number of other centres were reported. Comparatively little vaccine is used. Large outbreaks are uncommon although continuous deaths of calves in small numbers on dairy farms where hygiene and calf management is bad account for many deaths over the period of a year.

Horsesickness. Although accurate figures of the total number of deaths during the year are not available, there have been very few reported and confirmed as compared with the previous two seasons. The new freeze dried vaccine reported on last year, continues to be less popular with horse owners than the liquid vaccine. Inoculations of horses are mostly done by the owners themselves, who have reported a few deaths in inoculated animals.

Biliary Fever (Horses). Six cases were confirmed.

Sweating Sickness. There was a widespread incidence but deaths were not excessive. It is becoming more widely known that the vector of Sweating Sickness is the bont-legged tick and consequently prophylactic control measures are receiving increased attention.

Myiasis. A high incidence was reported from all Veterinary districts, although there has been a slight decrease in numbers of cases, due it is thought, to the wider use of B.H.C., D.D.T., etc., in dip wash.

Ophthalmia. The seasonal high incidence is reported although it is thought that there were fewer cases than normal, due to additions of fly repellants to dipping fluids.

Coccidiosis. A small number of outbreaks are reported from all districts. Infection in Mashonaland is more common than in other areas.

Agalactia. This was again troublesome in the Fort Victoria Veterinary area, although fortunately the number of cases has been low. Investigations are still proceeding but it must be stated that little progress has been made. There is still no evidence to disprove the original contention

held by some that the causal agent is contained in the food. Experimental work is continuing on an increased scale.

Ephemeral Fever. There is little to report. Infection was fairly widespread in the eastern part of the country. Isolated deaths reported were mostly in highly bred stock.

Verminosis. Steady progress has been made. An appreciable number of stockowners are attempting to reduce infestations in their herds. Although not dramatic, good results have been enjoyed where correct dosing has been carried out in accordance with a properly recommended programme based on local conditions. The Department has successfully continued to stimulate interest in this somewhat neglected aspect of the livestock industry.

Rift Valley Fever and Wesselsbron Virus. Blood samples taken from 15 properties in Matabeleland revealed the presence of Rift Valley Fever on 9 of these, while Wesselsbron Virus was found to be present on 12 of these 15 farms.

In the Mashonaland area, blood tests taken from two farms showed Rift Valley Fever to be present on one, and Wesselsbron Virus on both of these farms. In the Melsetter Veterinary area lowveld, 160 blood tests taken gave 11 positive results for Rift Valley Fever and 43 for Wesselsbron Virus.

It is evident that these two viruses are at present or have been widespread over the country. The significance of these two closely associated viruses is not clear: they have been associated with and almost certainly caused a high percentage of abortions in a few dairy herds although there have been no major epizootics of the disease as have been experienced by neighbouring territories.

Other Diseases. Vibriosis of cattle, a disease causing abortion and sterility, has been confirmed on one property in Matabeleland and also on one in Mashonaland.

Trichomoniasis foetus has also been diagnosed on one property.

During the course of the year the Department has dealt with many minor diseases and conditions such as Enterotoxaemia, Strangles and Photo Sensitization.

Poisoning. Arsenic:—

Bulawayo 196, Salisbury 388, Melsetter 40, Umtali 49, Fort Victoria 15, Gwelo 36. Total 724.

Mineral Various:—

Bulawayo 63, Salisbury 61, Umtali 16, Gwelo 3. Total 143.

Vegetable:—

Bulawayo 110, Salisbury 30, Melsetter 13, Umtali 6. Total 159.

Artificial Insemination. In Mashonaland, particularly around Salisbury, this service has become very popular. This, however, is not the case in and around Bulawayo where little interest has been shown. It is hoped to stimulate more interest in the Bulawayo area during the coming year.

Meat Inspection. Meat Inspection at all the Cold Storage Commission Works, namely, Bulawayo, Salisbury, Umtali and Fort Victoria and at Liebigs Canning Factory at West Nicholson, continued to be a duty of the Department.

I wish to express my thanks to both the Federal and Territorial Departments with whom the Veterinary Department has worked during the past year. I wish also to express my appreciation to all members of my staff who have at all times given their best during this past year.

STOCK SLAUGHTER FIGURES

	Cattle	*Pigs*	*Sheep and Goats*
Bulawayo	48,828	13,773	70
Salisbury	52,600	41,095	8,818
Umtali	7,143	7,569	2,735
Fort Victoria	19,368	4,391	576
Liebeg's, West Nicholson	11,606	1,143	—
	139,545	67,971	12,199

The corresponding figures for last year were:—cattle, 165,936; pigs, 80,118; sheep and goats, 13,524.

CARCASE CONDEMNATIONS

	Cattle	*Pigs*	*Sheep and Goats*
Bulawayo	294	246	—
Salisbury	469	54	34
Umtali	116	36	1
Fort Victoria	258¼	26	—
Liebig's, West Nicholson	42	9	—
	1,179¼	371	35

MAIN REASONS FOR CONDEMNATIONS

	Cattle	*Pigs*	*Sheep and Goats*
Emaciation	245	7	21
Measles	438	310	—
Oedema	92	1	—
Sarcocysts	89	6	—
Bruising	36	2¼	3
Pleurisy and Peritonitis	151½	3¼	—
Pyaemia	29	13	—
Tuberculosis	29½	2	—

CATTLE CENSUS AND DIPPING TANKS

	European	*Native*	*Total*	*Dip Tanks*	*Sprays*
Bulawayo	444,772	714,036	1,158,808	1,156	50
Salisbury	386,828	338,344	725,172	1,729	320
Fort Victoria	168,270	440,030	608,300	565	16
Gwelo	254,242	255,274	509,516	759	7
Umtali	69,237	128,237	197,474	444	20
Melsetter	50,574	40,339	90,913	236	5
	1,373,923	1,916,260	3,290,183	4,889	418

IMPORTATION OF LIVESTOCK, 1955/1956

	South Africa	*United Kingdom*	*U.S.A.*	*Eire*	*Bechuana-land*	*Northern Rhodesia*	*Total*
Bulls	263	7	7	—	10	1	288
Cows	308	1	—	—	55	—	364
Heifers	801	23	32	—	20	—	882
Calves	78	1	—	—	30	6	109
Oxen	—	—	—	—	16	—	16
Mares	171	—	—	3	—	1	175
Stallions	60	1	—	—	—	—	61
Geldings	315	—	—	—	—	1	316
Mules	67	—	—	—	—	—	67
Donkeys	—	—	—	—	—	—	—
Pigs	—	3	—	—	1,559	—	1,562
Sheep	431	—	—	—	3,097	—	3,528
Goats	52	—	—	—	1,511	—	1,563
				TOTAL			8,931

Bovine, 1,659; Equine, 619; Porcine, 1,562; Ovine, 3,528; Caprine, 1,563.

EXPORTATION OF LIVESTOCK, 1955/1956

	Northern Rhodesia	*Nyasa-land*	*South Africa*	*Belgian Congo*	*P. East Africa*	*Bechuana-land*	*Kenya*	*Total*
Bulls	69	14	22	41	6	46	1	199
Cows	648	23	—	42	—	—	—	713
Heifers	2,981	4	59	1,316	—	—	—	4,360
Oxen	65	—	—	—	—	6	—	71
Calves	66	4	—	—	—	—	—	70
Mixed Bovines	463	—	—	—	13	—	—	476
Mares	5	—	2	4	1	1	—	13
Stallions	1	1	3	2	—	—	—	7
Geldings	23	2	2	89	3	—	—	119
Mules	—	—	—	40	—	—	—	40
Donkeys	33	—	—	1,900	—	—	—	1,933
Pigs	236	6	15	—	6	1	—	264
Sheep	756	7	—	605	—	—	—	1,368
Goats	303	—	—	65	—	—	—	368
				TOTAL				10,001

Bovine, 5,889; Equine, 2,112; Porcine, 264; Ovine, 1,368; Caprine, 368.

J. MACKINNON,
Assistant Director of Veterinary Services (Field).

REPORT OF THE ACTING ASSISTANT DIRECTOR OF VETERINARY SERVICES (RESEARCH) FOR THE YEAR ENDING 30th SEPTEMBER, 1956

Staff

During the year the establishment has been increased so that our present complement consists of:—

A.D.V.S.(R.).
1 S.P.O. II—Veterinary Officer.
4 P.O.'s—Veterinary Officers.
1 Laboratory Technician (P.O. Woman).
1 Laboratory Assistant (S. & T.O. II).
2 Assistant (T.A.).
1 Lay Inseminator.
1 Animal Health Inspector.
1 Station Superintendent.
1 Stockman.
1 Administrative and Executive Officer.
1 Clerical Officer (Typist).

The staff, however, especially on the veterinary side has been considerably below strength. At no time have we had more than three veterinary officers and for a considerable time only two. Mr. Shone spent a period of four months at Onderstepoort, studying virus techniques. Mr. Darbyshire resigned and left the service in July, so that at present there are four vacant posts.

Under such conditions it is hardly possible to envisage extensive research being undertaken, in fact it is difficult even now to carry out work to which we have already been committed.

Buildings

Further internal alterations to the main buildings have resulted in the provision of a new mousery, packing room and a post mortem room for rabies. These renovations are almost completed and should be taken over in November. Similarly the vaccine block cum library, which has been under construction since the beginning of the year, should be available for occupation during November. It is hoped to build up a satisfactory reference library during the next few years which should prove an asset to the Laboratory and the Field staff.

The increases to the staff, the alterations to the buildings, the new vaccine block and finally the further building programme envisaged in the next few years are all obvious signs of the recognition of the necessity and of the importance of veterinary research to this country.

The drive for intensified food production is world wide and while we still are one of the fortunate countries in having fresh areas to bring under cultivation it behoves us now to improve our production in the areas already being farmed.

The establishment increases will enable individual officers to tackle individual problems—a method far more likely to bring successful results than having too few officers dividing their time over too many problems.

The present inability to obtain staff appears to be mainly due to the fact that conditions are more attractive elsewhere so that obviously if we are to attract and retain the right type of officer we must be prepared to offer at least as attractive terms as our neighbouring territories.

ROUTINE SERVICES

Diagnostic Services

Smear Examination. Relatively few smears were examined at the Laboratory as a result of direct farmer inquiries—these being mostly referred to the District Veterinary Office. The smear examination undertaken was mostly of a confirmatory nature except in the case of smears examined for Trypanosomiasis.

The total number of smears examined was 1,264 and the details of conditions diagnosed as follows:—

Piroplasmosis	3
Theileriosis	57
Quarter Evil	9
Trypanosomiasis	64
(T. Congo 46, T. vivax 17, T. congo and T. bruceil.)	
Spirochaetosis	1
Anaplasmosis	1

Serological Tests. 5,364 Agglutination tests were carried out for Contagious Abortion giving 322 positive samples involving 80 farms.

Other Diagnostic Methods. 1,044 specimens were received during the year—the following conditions and diseases have been diagnosed from these specimens:—

Rabies—52 cases.

181 specimens were received for diagnosis and 145 biological tests were undertaken with the histologically negative cases and 15 of these proved to be positive, 46 dogs were positive, only 3 of which had been vaccinated, 2 jackals and 2 bovines were also positive. Two human cases occurred one of which had a known positive dog contact, but in the second case there was only a history of a dog bite eighteen months prior to death—unfortunately the dog was destroyed at the time of biting and no attempt at diagnosis was made.

Contagious Epididmyitis	9 cases
Calf Paratyphoid	8 cases
Mastitis	35 cases
Internal Parasites	36 cases
Trichomoniasis	1 outbreak

This condition was diagnosed by a member of the Field staff, and confirmed by the Laboratory, in a herd in the Sabi Valley. It is obvious from the history of the herd that the condition must have been existing for some time, but its unspectacular character had not caused great anxiety about the existence of disease in the herd. This condition has only been recorded once previously in the country, namely in 1949, in several imported animals in the Laboratory vaccination stables.

Vibrio-foetus . . . . . 2 outbreaks

Although the existence of this condition has been suspected during the past year it was only in the last few months that a diagnosis was made. In Salisbury the organism was isolated from the fourth stomach of an aborted foetus, while in Bulawayo the diagnosis was made on the submission of vaginal mucus samples to the United Kingdom. It seems possible that this condition is fairly widespread and we are at present producing an antigen so that a series of survey tests can be undertaken in herds with suspicious histories.

Poisoning	75 arsenical
	9 fertiliser
	8 salt
	1 lead

The great predominance of arsenical dipping is responsible for a large number of deaths in cattle during the year of which the above 75 is merely fractional. Sodium hypochlorite (hypo) given as a drench at the rate of two ounces in a pint of water, or, in an emergency, 5 grams in 100 c.c.s of boiled water given intravenously, is still the cheapest and the most effective remedy.

Tuberculin Tests. 77 animals were tested at the Laboratory Stables—no reactors were found.

Poultry. Poultry diagnosis operates as a non-paying service to the public, and in the vast majority of cases is indicative of the disease position around the Salisbury district only. 1,352 poultry post mortems have been undertaken during the year and the following conditions diagnosed:—

Coccidiosis	291 cases
Chronic Respiratory Disease	46 cases
Fowl Cholera	12 cases
Fowl Typhoid	34 cases
B.W.D.	1 case
Fowl Pox	2 cases
Aegyptionella	1 case
Visceral lymphomatosis	159 cases
Neural lymphomatosis	16 cases
Ascariasis	9 cases
Histomoniasis	18 cases
Visceral gout	7 cases

Coccidiosis continues to show the heaviest mortality of all diseases, in spite of the increased use of a considerable range of reputedly effective drugs.

It is thought that part of this loss is due to a combination of the deep litter system, and the use of "premix" drugs leading to a slackening in observance of proper hygiene. It is considered that in deep litter conditions during the rainy season it is extremely difficult to control such conditions as coccidiosis and bacterial infections.

The use of antibiotic medicated drinking water for the control of respiratory diseases is extensively advocated but again it should be an adjunct to, and should in no way replace, good hygiene.

Only one outbreak of B.W.D. was recorded in spite of extensive testing by the Field staff. All reactors to the "spot" test are forwarded to the Laboratory for further test, post mortem, and cultural examination. Although we still produce a fowl typhoid vaccine we consider that more effective control can be obtained by "testing out" the condition plus the application of good hygiene than by vaccination alone, as the vaccine gives only a relatively short period of protection.

Sporadic cases of fowl cholera continue to appear and the slaughter out policy is still being adopted. A trial was carried out using a dead vaccine under Laboratory conditions but the protection afforded was not very effective.

Lymphomatosis, visceral and neural, continues to effect a heavy toll, and will continue to do so as long as the public are not discriminative in their purchases of day old chicks.

PREVENTIVE AND CURATIVE SERVICES

Vaccines and Remedies

More publicity is required to make the farming public aware of the benefits of protective vaccination—the cost of the protection afforded by Quarter Evil vaccine at threepence a dose, and by Contagious Abortion at fourpence a dose is minimal, compared with the loss these conditions can levy on unprotected herds.

Quarter Evil Vaccine. In the past year 419,912 doses of Quarter Evil vaccine were sold for use in cattle and 1,030 doses for use in sheep. Although there are several commercial products on the market the total number of animals vaccinated is small when compared with the number which should be vaccinated.

It is now becoming obvious that we must undertake the production of a mixed Quarter Evil and Clostridium Septique vaccine as the latter condition has been diagnosed on several occasions throughout the year and in various areas, so that it is possible that several of the reported breakdowns in Quarter Evil vaccinated animals were due to this condition. It is felt that it will be more effective to issue a combined vaccine at the cost of sixpence a dose than to limit the use of C. Septique vaccine to these areas where the condition exists.

Horse Sickness Vaccine. Only 3,778 doses of this vaccine were issued during the year—a decrease of approximately 240 doses from the previous year. This drop in the number of animals vaccinated has been noticeable during the last few years and presumably represents a reduction in the actual number of horses in the country. The horse in Southern Rhodesia is entirely used for riding, polo or racing and has little place in farming economy with perhaps the possible exception of ranching.

Redwater and Gallsickness Vaccine and Immunization of Cattle. A total of 142 animals were received at the Laboratory and the following were the countries of origin:—

57 ex United Kingdom, 37 ex United States of America, 27 ex Union of South Africa, 1 ex South West Africa, 12 ex Nyasaland, 5 ex Northern Rhodesia, and 3 ex Southern Rhodesia.

Only 68, out of the total 142 animals, were for vaccination—the remainder were detained in quarantine only. The numbers imported of the various breeds were as follows:—

Brahmin 38, Ayshire 37, Jerseys 18, Friesland 14, Hissar 12, Afrikander 9, Guernsey 6, Red Poll 3, Sussex 2, South Devon 2, and Shorthorn 1.

A total of 2,588 doses of mixed redwater and gallsickness vaccine were issued while 15,441 doses of gallsickness alone, were issued. Generally speaking the mixed vaccine is used—with possibly one notable exception —on dairy or pedigree beef herds while the gallsickness vaccine is used by ranch herds. There has been a marked increase in the use of this latter vaccine in newly weaned ranch stock during the last two years and the majority of the vaccinations in these take place in April to June.

883 smears were examined from animals vaccinated at the Laboratory and 337 from animals vaccinated on the farms.

With the increase in the number of veterinary surgeons in the country it is considered that a large number of the imported cattle could be vaccinated on the farms, thus releasing considerable stable accommodation at the Laboratory for experimental work.

Contagius Abortion Vaccine. The amount of vaccine sold increased by approximately 7,000 doses as compared with last year, the total number of doses being 61,236.

Many farmers have complained that the dried vaccine tends to cause considerable swelling at the site of inoculation, even in many cases leading to abscess formation. Investigations show that this is due to a variety of causes, and we suggest that the reaction can be limited if care is taken to ensure that thorough emulsification of the dried vaccine takes place before injection, that the site behind the point of the elbow is used rather than the neck, and that the site is thoroughly massaged following injection. The presence of comparatively large particles of bacillary masses is bound to increase the reaction to vaccination and as far as the site is concerned there is more constant self massaging action in the elbow region than in the neck. The abscessation encountered in some cases is most probably due to lack of sterile precautions during emulsification and injection.

Anthrax Vaccine. Native Reserve vaccinations again accounted for a large proportion of the 70,690 doses of Antrax Vaccine sold. It is customary to vaccinate only on the farms or ranches when actual outbreaks have occurred.

Calf Paratyphoid Vaccine. 7,187 doses of the calf vaccine have been issued and 778 doses of the vaccine for adults. The demand for this vaccine, though constant, remains low, in the majority of cases its use being confined to those farms where outbreaks have occurred. At least two cases of shock following the use of the calf vaccine have been reported during the year but no particular factor could be incriminated.

Blue Tongue Vaccine. The use of this vaccine rose by 800 doses to 2,600 doses—presumably due to increased importation of sheep other than black headed persian and subsequent crossing with that strain. The black head Persian sheep are resistant to blue tongue but other breeds and crosses require to be vaccinated.

Fowl Pox Vaccine. A considerable increase in the use of this vaccine was observed this year—293,900 doses being used as against 211,000 doses last year.

While we do not get many cases of Fowl Pox at the Laboratory for diagnosis it is obvious that the poultry keeping public are well aware of the benefits of this vaccine.

Rift Valley Fever. 2,850 doses of this vaccine were sold this year.

While no extensive general survey of the country has been done it is obvious from the results of investigations undertaken that the condition is relatively widespread and is invariably associated with abortion. It is considered that the infection in most cases is of recent origin as the abortions are not confined to heifers, but involve animals of all ages. Wesselbron virus antibodies have been received in several herds and as in the case of Rift Valley Fever appears to be associated with abortion.

Enterotoxaemia Vaccine. 2,900 doses of this vaccine were sold.

Remedies. Tetram 218 gallons, and nodular worm remedy 786 tins were sold during the year. The considerable drop in quantities of those remedies sold does not represent a true diminution in the number of sheep dosed, as many farmers now use the commercial products which are readily available.

ARTIFICIAL INSEMINATION—REPORT SUBMITTED BY MR. D. K. SHONE

Staff. In August, 1956, a fully trained lay inseminator was appointed to the vacant post in Bulawayo. He commenced his duties immediately, serving a thirty mile radius area. The centre in Salisbury is under the control of a Veterinary Surgeon and one full time Inseminator. In addition a second inseminator has been trained and he assists whenever there are too many calls for one person to deal with. Part of his duties consist of attending to the despatch of semen, the keeping of records and he is also employed in general laboratory work.

Bulls. The bull strength remains at four Frieslands and two Jerseys. Regular collections have been made throughout the year. A little difficulty was encountered due to foot trouble but this soon responded to treatment. The concentrate ration remains unchanged and the bulls continue to be tethered in paddocks during the day—this has been found essential to the continuance of their good health. The ensilage ration has been supplemented by ten pounds of green food daily per bull.

Semen. A study of the comparison of the demand for semen in the Salisbury area with that of last year reveals some very significant facts.

	1955	1956
Semen used on "Epi-vag" farms	670	1,112
Semen used on other farms	1,199	757
	1,869	1,869

The number of doses used during both years is exactly the same but there has been an almost complete switch over in the number of doses used on "Epi-vag" farms and other farms. The fact that there has been an increase of 442 doses used on "Epi-vag" farms indicates that these farmers are satisfied with the results being obtained by the service and this is supported by the fact that they report conception rates of between 70% and 80%.

The drop in the number of doses used on clean or other farms appear to be due to the high cost of the service to these farmers. Conception rates on those farms lie in the region of 75% to 80%. The service was originally introduced as a disease control measure and as such it is serving its purpose admirably, but consideration should be given to encouraging its use on those farms not in quarantine as a heard improvement measure, and as a control measure for Vibrio-foetus which has recently been diagnosed in the country.

Comparatively speaking the cost of an insemination to a quarantine farm 20 miles from the Laboratory is 15s. as no mileage charge is levied while that to a clean farm the same distance away is 55s.

The number of doses of semen used in the Bulawayo area shows a fall of 254 doses compared with last year's figures. It is, however, hoped that with the establishment of a whole time inseminator in the district an increase will be recorded in the coming year.

The greatest drop in the demand for semen has been by the farmers undertaking their own inseminations. This has decreased by 1,056 doses from 1,779 to 723. Presumably this is due to the poor conception rate being obtained by these farmers. The limited number of cows which they have for insemination precludes their ever becoming proficient and this is probably the main reason for the poor conception rate, followed by incorrect handling and storage of the semen.

A further factor which is probably partly responsible for the decrease in the number of doses supplied is the time taken up in ordering, collecting and finally in using the semen.

The nominated service supplying deep frozen semen came into operation in May of this year, but only a total of 70 doses has been used in the Salisbury district. The demand has not been as good as was anticipated but this is probably due to the same reason responsible for the drop in doses used on clean farms, namely the cost of the service.

Details of Semen Supplied—

Used by inseminator	1,869
Used by District Veterinary Officers Bulawayo and Gwelo	323
Supplied to Farmers	722
Used on Department animals	74
TOTAL	2,988

Number of doses of Friesland semen	2,534
Number of doses of Jersey semen	454

Details of Mileage Covered—

Inseminations of Government animals	155
Inseminations on "Epi-vag" farms	18,518
Inseminations on clean farms	10,739
TOTAL	29,412

Details of Semen used by Inseminator—

	Friesland	*Jersey*	*Total*
On "Epi-vag" quarantine farms	1,054	58	1,112
On clean farms	612	145	757
On Government farms	54	20	74
TOTALS	1,720	223	1,943

Revenue—

Mileage—10,739 miles @ 1s. per mile	£536 19s. 0d.
Semen—2,844 doses @ 15s. per dose	£2,133 0s. 0d.
Semen—70 doses @ 20s. per dose	£70 0s. 0d.
Railage	£32 2s. 3d.
TOTAL	£2,772 1s. 3d.

INVESTIGATION AND RESEARCH

Rabies. Further work on the viability of the vaccine has been carried out. Single and ten dose vaccine samples were selected and put in a bacteriological incubator. This vaccine was tested for viability at 7 days, 10 days, 14 days, 17 days and 21 days through dilutions of 10^{-2} to 10^{-4}. A similar number of vaccine doses were carried in a motor car and tested at these intervals. During the day when the car was not in use the windows were closed so that temperatures as high as 130° F. were recorded.

Under the above conditions there did not appear to be deterioration in the viability of the vaccine until between the 10th and 14th day, in either the car or the incubator samples.

During the year at least three samples which had been exposed to prevailing temperatures for at least seven days were checked and no deterioration could be noted.

It appears clear that the vaccine can withstand a temperature of 37° C. for at least a week without deterioration.

Theileriosis. At least five outbreaks of this condition occurred in one area of the Salisbury District this year, and it was interesting to note that the affected farms were on a known stock route beween a Native Reserve and the Cold Storage Commission stock yards. Later investigation showed the presence of disease in this Native Reserve. Various drugs, including such antibiotics as aureormycin and terramycin were tried out without any apparent successful results, even in relatively early cases.

It was noticeable that cattle suffering from this condition were extremely susceptible to intravenous injections even when lung symptoms were barely present; this fact has been recorded previously during therapeutic trials.

Larval and nymphal ticks supplied by the Director of Veterinary Services, Onderstepoort, were fed on affected cattle and returned for immunity trials.

Internal Parasites. In view of the increasing acreages of irrigated pastures in the country and the possible effect on the worm burden carried by animals grazing on these pastures, we are undertaking, with the assistance and permission of the Grasslands Research Station, Marandellas, a comparison of several methods of treatment. The following groups are included in the experiment:—

(1) Normal dosing routine, i.e. nicotine-copper-arsenic, phenothiazine, nodular worm remedy, minel and tetram in rotation every three weeks.

(2) Phenothiazine every three weeks.

(3) Tetram every three weeks.

(4) Phenothiazine in a salt lick ad lib. (1 : 14.)

(5) No treatment.

Records being kept include liveweight changes and worm egg counts. As this experiment was commenced during the dry season the results available to date do not favour any particular treatment.

Low Fertility in Ranch Cattle. Work was continued on this problem during the year both at Charter Estate and at Grasslands Research Station, Marandellas.

(1) Animals conceiving but losing their calves.

Following last year's results where we recorded a variation of approximately 15% between conception rates and calving rates, we selected 200 three-year-old heifers, checked and found to be 91% in calf and we fed half of this group from June onwards with 10 lb. of silage per head per day until the rains came. It was considered that possibly the low condition of the cows was responsible for part of the calf loss.

When the final figures were available it was seen that there was no significant difference between the two groups, but as the season progressed there was seen to be a considerable difference in appearance of the calves and of the cows. A weight check of the complete group revealed that in the fed group the cows averaged 88 lb. heavier than in the unfed group, while the calves were 37 lb. heavier on an average than those of the unfed group.

An outbreak of ringworm occurred in the calves showing a 2.6% infection in the fed group and 22% in the unfed group. These cows have been put to the bull again during January to March, 1956, and a check showed a 9% improvement in the conception rate in the fed group—the actual figures were 56% in calf in the unfed group and 65% in the fed group.

This result of a high percentage of cows not conceiving while they have calves at foot is quite consistent with results of work of the previous year where a group of cows with no calves-at-foot showed a 96% conception rate, as against a 58% conception rate of cows with calves-at-foot. There was actually a further 4% showing ovarian function in the no calves-at-foot group, compared with 10% in the calves-at-foot group. The most interesting point is the failure to conceive of 42% of cows with calves-at-foot. In an endeavour to secure a higher calving rate and in the hope of getting such animals in calf without a complete year's blank we are putting them to the bull again in August and September—the figures of conception rate following this bulling are not yet available. This group of two hundred animals have been individually marked and will be examined over a period of several years.

We have selected a further one hundred three-year-old heifers, checked and found to be 96% in calf which are to be intensively supervised during the coming calving season with a view to ascertaining why these losses are occurring.

(2) Animals with dormant ovaries.

A comparison of the last three years' examinations of three-year-old heifers shows an interesting improvement in the conception rate as judged by the following figures:—

Year	*In calf.*	*Ovaries funct.*	*Ovaries not funct.*
1954	67%	10%	23%
1955	91%	5%	4%
1956	95%	4%	1%

It is thought that this is due to the fact that the 1954 heifers were born in the last drought year and therefore were not on such a good nutritional level as the 1955, and 1956, heifers.

Past experience has shown that when two-year-old animals are put to service, the conception rate is relatively low, about 10% to 15%. During the year we examined a selected group of two-year-old heifers which had been fed as yearlings receiving 2 lb. of cubes per day from July to September, and were well grown compared with the run of the ranch two-year-olds. These revealed a 56% conception rate and a 30% non-functioning ovary rate.

The comparison being undertaken between fifty cattle at Charter Estate and fifty cattle at Grasslands Research Station, Marandellas, is still being continued. Periodic weighings have shown that the Grasslands animals are doing better on veld there than those on Charter Estate, and this is reflected in the fact that the rate of ovarian function is higher at Marandellas than at Charter.

The Marandellas group have been subdivided to form protein and mono-phosphate fed groups —the variation recorded in those groups does not as yet appear significant. Both the Charter and the Marandellas animals will be put to the bull this wet season when they are three years old.

Contagious Infertility. The problem of this condition among our dairy and ranch herds is one the importance of which cannot be over-estimated. Lack of staff prevents the full-time investigation which requires to be undertaken. It is becoming more and more obvious that we are dealing with more than one condition. Previously a typical outbreak was characterized by well marked epididymal lesions in the bull and extensive vaginitis with pus production in the female. Recently however we are encountering a considerable variation in this syndrome.

Lesions considered to be typical have been encountered in the fallopian tubules and ovaries of cows in herds which have not been exposed to infection by contact or addition and in which no lesions are occurring in the bulls.

Cases have occurred of young heifers showing vaginitis and pus without any drop in fertility.

In view of the complexity of conditions which may give rise to a vaginitis and the difficulty of a specific diagnosis in the indvidual female based on a speculum examination it was felt that the criteria of infection in experimental transmission lay upon the production of an epididymitis in the bull.

Six cows at the Gwebi Epi-vag station were selected for this transmission work. These cows had either been infected when obtained from infected herds or had been experimentally infected with material obtained from infected herds. Each of the cows was served by a mature Friesland bull over a period of approximately six months on a number of occasions and from two to five times on each occasion. The bulls have been kept under observation for a period of a year and no epididymal changes of any description have been noted.

It would appear either that infection does not persist even although the animal may be clinically positive, or that the bulls used were not readily infected by this method.

Isolation of an Aetiological Agent. The Field staff co-operated in forwarding testicles from suspected bulls in both 10% saline and 50% glycerine-saline. Material from the latter specimens were collected and used for isolation attempts in infant mice. Approximately a dozen such attempts were made all of which failed. Similar attempts employing vaginal mucous membrane from the cows used in the transmission work also failed.

MISCELLANEOUS

Mr. Shone spent a period of four months at Onderstepoort studying virus techniques. It has long been considered that we should set up a virus diagnostic unit in view of the increasing importance of virus diseases in the country. We greatly appreciate the assistance of the Director of Veterinary Services, Onderstepoort, in arranging this visit and allowing Mr. Shone to study in his laboratories and we hope that this may be the forerunner of many such visits. It is difficult, situated as we are, to keep abreast of modern techniques, and to spend a period of time at such a laboratory as Onderstepoort is both stimulating to the individual concerned and beneficial to his own laboratory.

We were fortunate in being able to have with us for a short visit Dr. Le Roux, who is at present undertaking a helminthological survey of Northern Rhodesia for F.A.O. His brief stay nevertheless made us realize more than ever the necessity for undertaking parasitological work and we trust that the vacancy for a parasitologist on the staff will soon be filled.

Professor Rasbech of the Royal Veterinary and Agricultural College, Copenhagen, Denmark, spent three months in the country on an assignment from F.A.O. studying infertility in cattle with special reference to ranch conditions. We found his visit extremely interesting and instructive from many points of view. Visits by such experts as Professor Rasbech do a tremendous amount of good and serve more than anything else to accentuate the importance of the problems with which we are dealing. It is is not possible for professional staff to be sent to other countries to gain information on how they are dealing with problems similar to our own, then we should invite or request such organizations as F.A.O. Rome, or W.H.O. Geneva, to send experts to study our problems on the spot. The visit of such men as they can provide can make available to us a wealth of knowledge and experience and allow us to progress at a much greater rate than we would ourselves plodding on in "splendid isolation."

G. J. CHRISTIE,

Acting Assistant Director of Veterinary Services (Research).

REPORT OF THE ACTING DIRECTOR OF THE DEPARTMENT OF TSETSE AND TRYPANOSOMIASIS CONTROL AND RECLAMATION FOR THE YEAR ENDED 30th SEPTEMBER, 1956

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     - (ii) Miami North and Chirundu.
     - (iii) Gota Gota.
   - (b) Lomagundi S.W. and Eastern Sebungwe.
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8. I.S.C.T.R. CONFERENCE.

9. ACKNOWLEDGMENTS.

1. INTRODUCTION

Some noteworthy events have taken place during the year under review. The Report of the Commission of Inquiry on Human and Animal Trypanosomiasis was published in January (Report of Commission of Inquiry on Human and Animal Trypanosomiasis in Southern Rhodesia. Government Printer C.Fed.24, 1956. Price 12s. 6d.). It reviewed the history of tsetse and trypanosomiasis in this country and made recommendations for improving the control measures used against the fly and the disease.

The Director of Tsetse Fly Operations, Mr. J. K. Chorley, retired at the end of March, after a long and distinguished career, during most of which he was directly responsible for the control of tsetse in this country. The success of his endeavours and the contribution which he has made to the development of the country may be gauged from the fact that while he was responsible for tsetse control some 10,000 square miles of territory were freed of fly and made available for agriculture.

In conformity with a recommendation of the Commission of Inquiry, a new Department of Tsetse and Trypanosomiasis Control and Reclamation came into being on July 1st, based on the Branch of Tsetse Fly Operations, but with augmented staff and financial resources. The establishment consists of a Director, a Senior Entomologist and 7 Entomologists, 5 Senior Field Officers, 25 Tsetse Field Officers, additional clerical staff, African Field Assistants and between 1,200 and 1,500 African labourers and hunters. Although they are appointed by, and attached to their respective Departments provision has been made for the appointment of 1 Senior Veterinary Officer, 2 Veterinary Officers and 10 Animal Health Inspectors, and 2 Assistant Native Commissioners and 2 Land Development Officers to co-operate in the activities of the Department. At present the posts of Director, of 2 entomologists, 5 Senior Field Officers and 6 Field Officers are still to be filled. The Veterinary and Native Department Officers have not yet been appointed.

A new laboratory is being built to house the Department. It is hoped that the building will be occupied early in 1957.

Certain recommendations made by the Commission were implemented. A field research station was established and partially equipped at Kariangwe in the Sebungwe District with Mr. D. F. Lovemore as entomologist in charge. The site is well suited for the pursuit of field investigations. Both *G. morsitans* and *G. pallidipes* occur in an area where no antitsetse operations have so far been carried out. It remains a natural, unspoiled habitat for both species and is also an area where human trypanosomiasis formerly occurred. The vegetation requirements and seasonal distribution of both species are being investigated and a collection blood meals from tsetse made for host identification.

Field surveys, aided in great measure by the use of aerial photographs, have been extended and intensified to define the present limits and abundance of tsetse. New records of the occurrence of *G. morsitans* and *G. pallidipes* have been plotted, particularly in the Sabi and Sebungwe areas, indicating where intensive control measures should be directed.

There has been an extension of the use of fences in anti-tsetse operations. Over 250 miles of fencing have been completed or are in course of erection. The shooting areas have been restricted and where practicable shooting has been discontinued. It has now been made illegal for African hunters to sell the proceeds of their kills.

Preliminary trials were carried out with Swingfog machines to assess their value as a means of combating tsetse in riverine thicket, and in cleansing traffic of fly under conditions of high traffic density.

As a result of the extended surveys, areas have been defined in the Sabi Valley and in the Urungwe and Sebungwe districts where it is considered that clearing of bush will have a marked effect on the tsetse, and consequently on the incidence of disease.

Clearing work has started on the Rupembi River in the Sabi Valley, using mechanical chain saws and hand labour.

Advice was given to the Federal Power Board on the use of aerial spraying in reducing the threat of tsetse to the Kariba township. A spraying programme was undertaken by the Board, under the technical direction of Mr. Phelps, of this Department. The operations have been successful within the limits set, and the results indicate that under suitable conditions, and in selected areas, aerial spraying can bring about a marked reduction of fly. It is very evident, however, that unless an area can be isolated against re-invasion and consolidated, aerial spraying cannot achieve permanent eradication of fly.

Little is known in this country of the effect of human settlement on tsetse. Settlement schemes in the Sebungwe and Urungwe districts, connected with the Kariba project, are based on recommendations by the entomologists so that they can exert maximum effect on the fly. The effect of the behaviour of the tsetse population is being closely followed.

Eleven meetings of the Trypanosomiasis Committee were held, all of which were attended by the Acting Director.

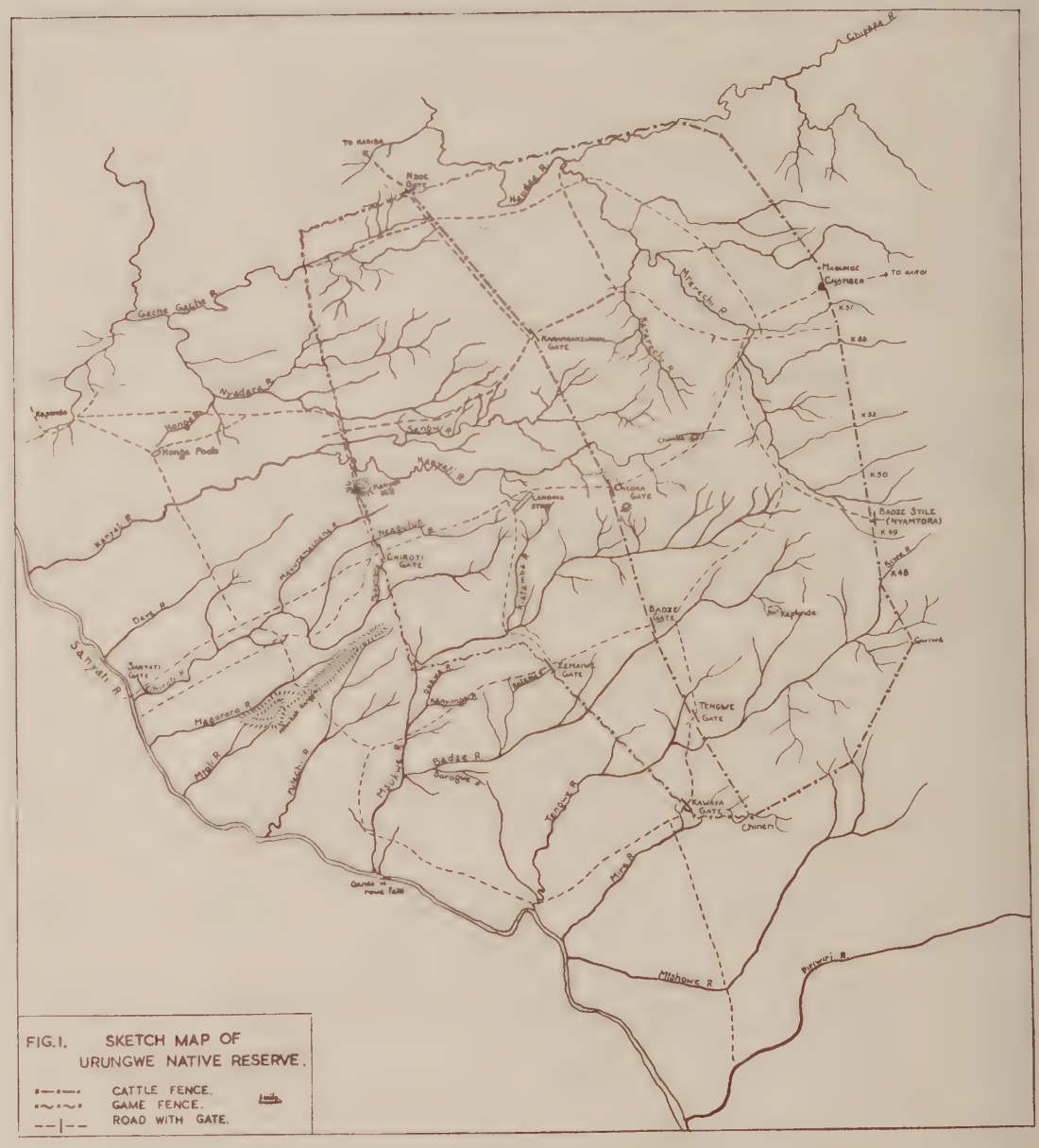


FIG. I. SKETCH MAP OF URUNGWE NATIVE RESERVE.

CATTLE FENCE.
GAME FENCE.
ROAD WITH GATE.

2. DISTRICT REPORTS

(a) Urungwe

(i) *Urungwe Native Reserve and Dekete* (Fig. 1). These areas have been supervised by one officer, and are here treated together.

It is evident from the numbers of fly taken at the traffc control points and from information obtained on patrols throughout known fly habitats that there has been a general reduction in available fly within the Reserve. Several factors have contributed to this decline in population. Game destruction operations, which have been carried out for many years, were re-organized and brought under closer control during 1954. They appear now to be achieving their object of reducing the game within the Reserve boundaries. Aerial spraying operations, carried out during 1953 and 1954 in the Musukwe-Badze basin are probably responsible for the decrease in fly taken at Zemaiwe and Badze Gates, but it is unlikely that the marked decline noted at Chiroti and Cheoka Gates could be attributed to their effect. There has been great activity in road making, dam building and borehole drilling in the area, causing disturbance of the game and fly.

The position, although greatly improved, cannot be regarded as being satisfactory until it is safe for the reintroduction of cattle into the Reserve. At present, although no *G. morsitans* have been taken within the eastern part of the Reserve or from traffic coming from that region, it can still be taken from traffic crossing the western part towards the central fence (see Appendix I). Furthermore, both *G. morsitans* and *G. pallidipes* have been taken at Nzoe Gate where the central and northern fences meet. Under these conditions, the introduction even of test herds of cattle in this area would be premature at present.

Game destruction operations continue but have been modified. The area has been divided into sections. Shooting was discontinued in the eastern part of the Reserve from November, 1955, and the hunters were moved to the western portion and between the western boundary and the Sanyati River. Fig. 2 shows the progressive decline in numbers of game shot in the western part of the Reserve, together with the total numbers of game larger than duiker, and also the numbers of fly taken on traffic from within the western part of the Reserve. There is clearly a relationship between decline in game and decline in available fly, consistent with the aims of game destruction operations. There have been relatively few larger buck involved in these operations. In fact, since these records began buck larger than duiker have formed only 8.7% of the animals killed in this area. Duiker comprised 59%, warthog 13.1%, bushpig 12.5% and baboons 6.7% of the total.

Since hunting operations ceased in the eastern part of the Reserve, there has been a steady increase reported in the numbers of duiker, grysbok and reedbuck.

In the Dekete section the numbers of larger buck have noticeably diminished, more rapidly than can be accounted for by the shooting alone, indicating that they have moved away.

Road building and settlement activities in the Sebungwe District across the Sanyati appear to have promoted movements of buffalo and elephant into the Dekete section.

The trypanosomiasis position on the European farms is satisfactory. Only one case of cattle trypanosomiasis was recorded. A blood smear taken from an animal on Farm K.48 during April was found to contain one parasite, *T. congolense*. Smears taken from this animal on the following day failed to produce further parasites. The animal recovered after treatment with dimidium bromide.

Some goats (47) and dogs (39) accompanied the Africans who were displaced from the Zambezi Valley and settled west of the central fence. Two of the dogs were later found to be infected, one with *T. congolense* and the other with *T. vivax*. Another dog introduced from Kariba by an Irrigation Department engineer was found to be infested with *T. congolense*.

In the eastern part of the Reserve there are numbers of donkeys, sheep, goats and pigs, amounting to 1,608 animmals. No trypanosomiasis has been reported in these animals.

There has been considerable road making, drilling and dam building activity connected with the settlement of Africans displaced from Kariba. The Field Officer in charge of the area has given valuable local information to the Departments concerned about sites for settlement, for roads and for water supplies.

Traffic control points have been maintained throughout the year. With the construction of a road across the Sanyati River, linking the Urungwe with the Sebungwe Districts, it became desirable to erect a further gate near the river. This has been designated Sanyati Gate. In three months of operation it has yielded 365 *G. morsitans*, indicating the extent to which fly can be carried on traffic.

Figure 3 indicates the total fly taken at all traffic control points since records began. Each point represents the total for a 12 month period, so that seasonal effects have been eliminated, and all are therefore comparable. During this period traffic through the gates has increased. There has been a progressive decrease in fly available to be carried by traffic which, it is considered, reflects a decline in the total fly population.

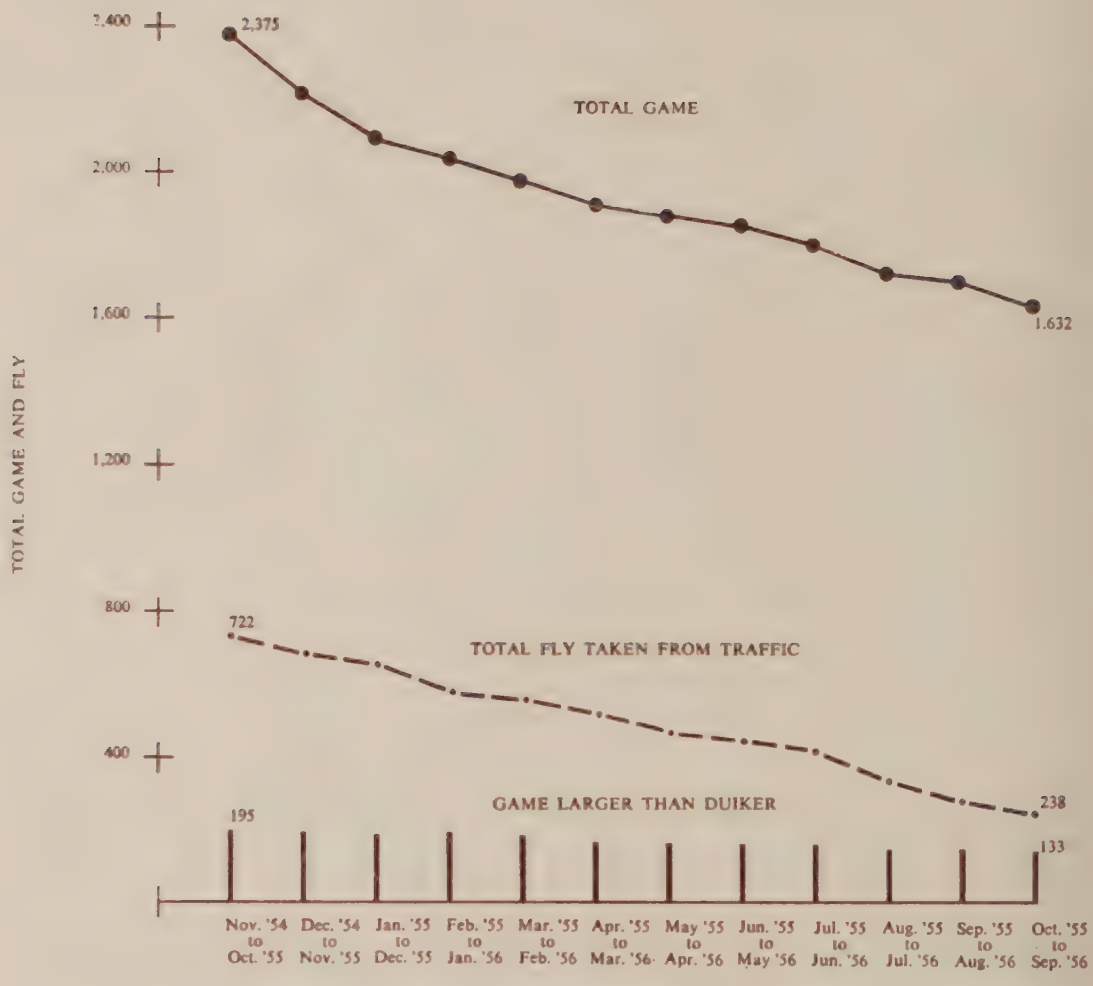


FIG. 2. URUNGWE NATIVE RESERVE: WESTERN SECTION

Total Game Killed, Larger Game and Total Fly taken at Traffic Control Points:
November 1954 to September 1956.
Each point indicates a total for 12 months.

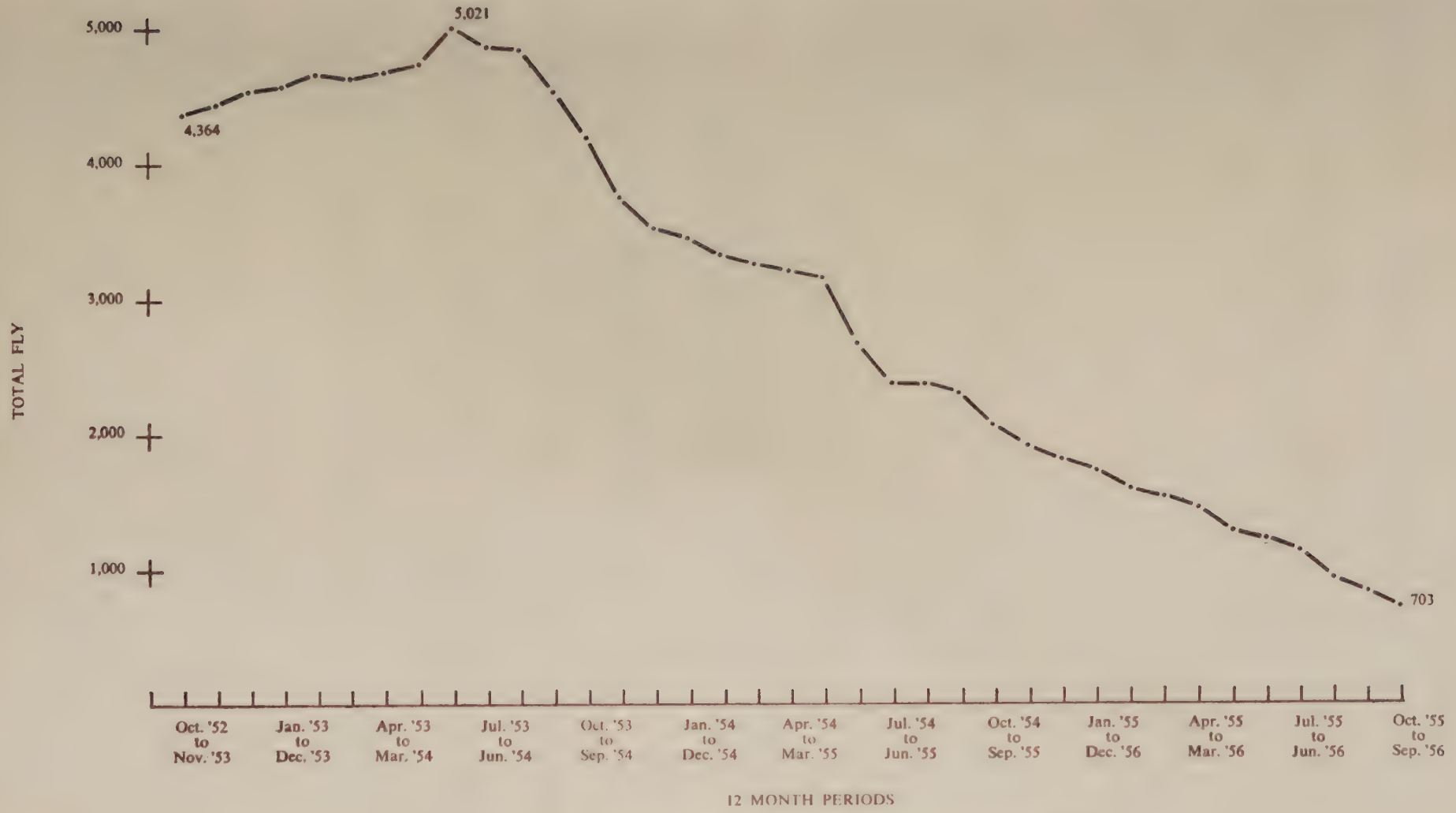


FIG. 3. TOTAL FLY FROM ALL TRAFFIC: URUNGWE NATIVE RESERVE

Several miles of roads formerly built and maintained by this Department have been reconstructed as wide all-weather roads for the Native Department. About 50 miles of road have been cut and made in the Dekete section.

Fences forming the northern, western and southern boundaries of the Reserve, and the Central fence have been maintained in good condition. Where roads have been realigned, the gates have been moved and re-erected.

(ii) *Miami North, and Chirundu.* The distribution of fly has not changed materially, but there has been a marked reduction in the fly taken at Chirundu and Makuti gates compared with the totals for 1954-55. At Chirundu the total fly taken for the year has dropped to less than half and at Makuti to almost a third despite a large increase in traffic through these gates. Patrols carried out in the Zambezi Valley indicated that dense fly can be detected near to the main road wherever suitable habitats occur.

The game position in the Chirundu strip has been summarized under the Chirundu Strip Survey.

Elsewhere the position is unchanged. The main road from Karoi to Chirundu has been realigned and remade. The existing chamber at Vuti will be replaced by a new chamber at the side of the new road.

Trials were carried out at Makuti Gate using Swingfog machines to cleanse traffic of fly.

(iii) *Gota Gota Section.* There has been a movement of fly associated with the disturbance caused by the opening of the main Kariba access road. Fly has become relatively scarce along this road but is dense along what is now the "old" Kariba road.

Hunting operations have now ceased in the area known as the Gache Gache triangle.

The general situation remains unchanged.

(b) **Lomagundi S.W.: Eastern Sebungwe**

Tsetse can be taken regularly between the Sanyati and Umvumvudzi Rivers northwards from the Ganda-va-rowe Falls, and in small numbers in the neighbourhood of Mtungi and Massimassu pans, where small pockets of fly persist.

Elephant are a serious problem. They move across the area visiting watering places en route and assisting in the spread of fly.

There were no reports of trypanosomiasis in 546 head of cattle in the Hova area.

(c) **North Lomagundi**

Patrols carried out during the year have indicated that tsetse is absent from the area between the Hunyani and Msengedzi rivers in the Zambezi Valley. It occurs to the west along the tributaries of the Angwa below the escarpment.

A report was received of the capture of one *G. morsitans* by a native on farm Kismet D.A.43. The Field Officer carried out exhaustive patrols over a period of five months, and established a traffic control point at Tondongwe but no tsetse were caught or seen.

Game is fairly numerous between the Ambi and Angwa Rivers. Elephant move in several herds between the Rakute and Urungu rivers in the Zambezi Valley. Between the Hunyani and Mesengedzi Rivers game is scarce.

No cases of trypanosomiasis were reported. Extensive smear surveys were carried out in the Doma area by the Veterinary Department, with negative results.

Roads are negotiable only during the dry season. About 8 miles of roads were constructed along the Hunyani in the Zambezi Valley.

(d) **Mrewa: Mtoko**

There has been an improvement in the tsetse position.

Since 1950 there has been a progressive extension of fly from Portuguese Territory, indicated by the occurrence of isolated captures of fly further and further westwards until in 1954 it was taken on the Nyamarere River which forms part of the boundary of the Mtoko Reserve. This year the most westerly penetration is indicated by the capture of one fly on the headwaters of the Nyagogo River, which is within the limits of the 1953 extension shown on the map "Tsetse Fly Operations, Mtoko District", accompanying the 1952-53 Annual Report. Towards the Portuguese Border, small numbers of fly can be taken fairly regularly along the Mudzi and Nyamsansara Rivers.

In the southern section, two fly were taken at Chanzarini Camp, brought by hunters. A total of 107 *G. morsitans* were taken on patrols near the Portuguese Border.

The traffic control points still indicate a low incidence of fly. At the Border Gate 89 flies were taken, and one at the Suskwe Chamber. At Mkota Gate covering the road to the Mkota

Reserve, three were taken from southbound traffic and one from northbound. Six were taken from westbound traffic at Makaha Chamber.

The trypanosomiasis position has also shown an improvement in the situation which had been threatening. During October, 1955, nine cases of trypanosomiasis were recorded in the Fungwe cattle, but only five for the remainder of the year. The Chikwiso cattle have increased in number. Only five positive cases have been recorded. Two positive cases were recorded from the Mtoko Reserve.

The erection of the cattle fence across the Fungwe Reserve and the withdrawal of all cattle northwards of it have prevented the cattle from watering on the Nyaderi River where, it is surmised, they formerly contracted the disease.

One case of human trypanosomiasis was reported from Mtoko, in an African who had apparently contracted the disease near Tete in Portuguese East Africa.

The game fence, which runs for about 45 miles between the Ruenya and Mazoe Rivers, was completed in October, 1956, dividing the area into eastern and western sections. Records indicate that the eastern sections towards the Portuguese Border harbour more game than the western sections.

It is interesting to record that one Lichtenstein's hartebeest (*Sigmoceros lichtensteinii lichtensteinii*) was taken in the Mtoko district.

(e) **Sebungwe**

This section is illustrated by Fig. 4.

The deterioration in the tsetse position has been progressive over the past few years. Fly have been found this year on traffic on the Central road and at Mahundula Store. One was taken on Mabonono River some five miles south of the Kana River. Table 1 indicates the progressive increase in total fly taken and in fly taken per 10 units of traffic of all kinds from Nagupande, Siambola and Mbungu barriers, which have all operated since 1953.

Control Point	Nagupande Chamber			Siambola Gate			Mbungu Gate				Average per 10 units of Traffic
Source of Fly	Cars	Cycles	Pedestrians	Cars	Cycles	Pedestrians	Cars	Cycles	Pedestrians	Total	
1953/54 .	302	663	133	56	91	98	12	47	27	1,429	2·9
1954/55 .	482	760	264	122	173	59	48	143	49	2,000	4·5
1955/56 .	588	636	379	164	180	87	57	213	59	2,363	5·0

Table 1: Total Fly taken annually from all traffic through Nagupande, Siambola and Mbungu control points, 1953–1956.

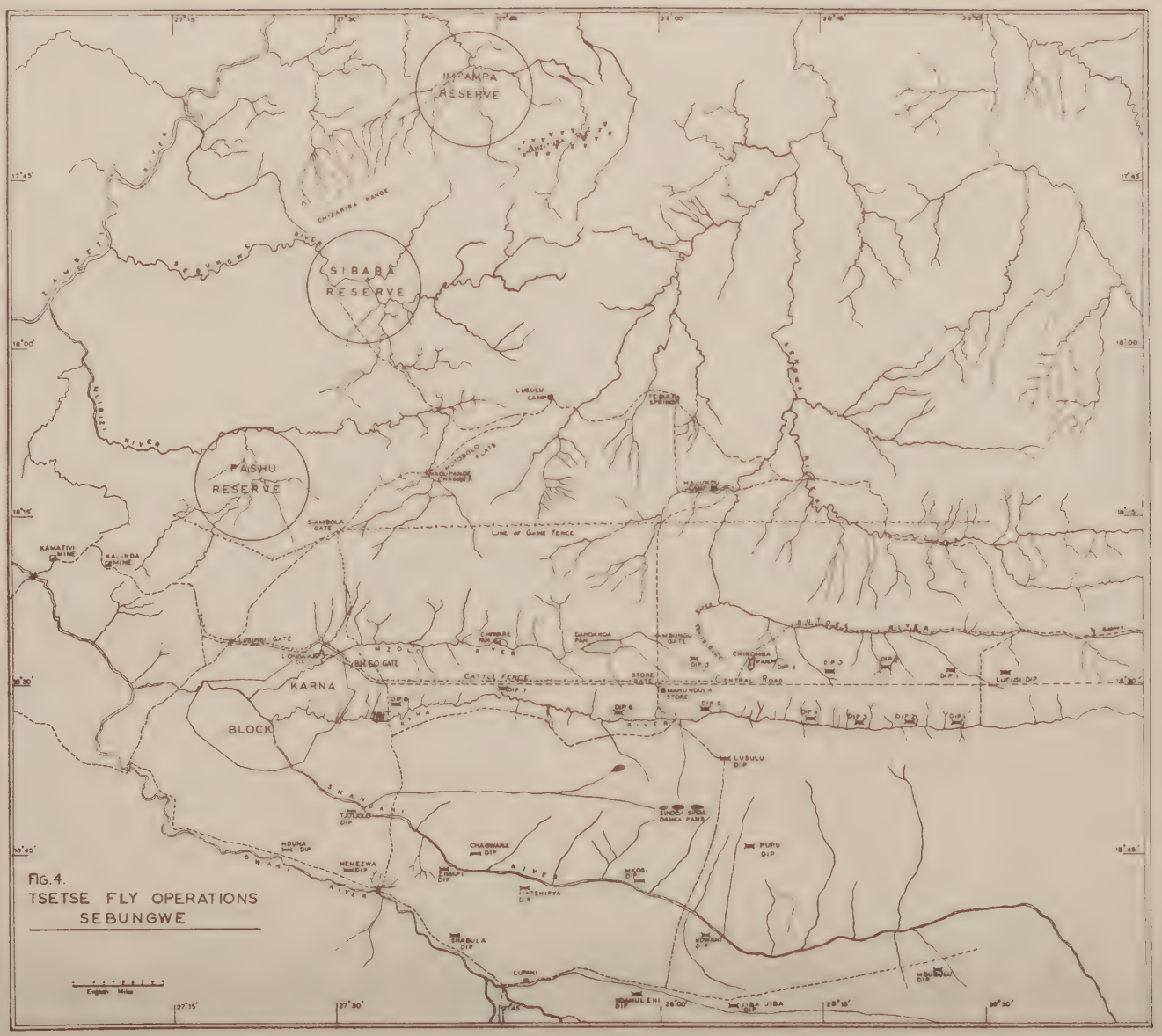
Repeated intensive surveys along the Kana River and its tributaries, however, have failed to discover tsetse. There is no evidence that fly has become established south of the Mzola River.

Recently tsetse have been taken at Lubimbi, where trypanosomiasis has also been reported in cattle. An entomologist has been stationed in the vicinity to carry out local surveys. A traffic control point in the cattle fence at Lubimbi has been established.

Trypanosomiasis has been present in the Lutope and Kana cattle since their introduction, but in April, 1956, trypanosomiasis was confirmed by the Veterinary Department in native-owned cattle at Lusulu dip tank in the Lupani S.N.A., west of the Shangani Native Reserve, some two miles south of the Kana River. This dip tank had previously been inspected in October, 1955, and found to be free of disease. During the rains it is inaccessible. Out of 25 kraals 17 were found to be infected. Extensive treatment was given, using dimidium bromide. During May, June and July new infection sites were identified. In August two sites remained infected but by September no positive cases were recorded from the blood smear survey. Treatment with dimidium bromide, although accompanied in some cases by marked photosensitization has proved to be effective.

The probable origin of the outbreak was the increased pressure of fly from Mzola and further north, and improved communications favourable to the carriage of fly to the Kana dip tanks. From these the disease has probably been spread, aided by other biting flies, by movements of cryptic cases in sales, in lobolo movements and by the migration of the owners as far south as the Shangani River. It has been established that cattle found to be infected at Mukosi Dip on the Shangani River had been moved from Lusulu Dip area where the infection had first been located.

A deputation from the Trypanosomiasis Committee, consisting of Messrs. Hornby and Lilford and the Acting Director of Tsetse and Trypanosomiasis Control visited the infected Kana dips in June to make recommendations for the control of what was then a threatening situation. It recommended the extension of the existing cattle fence eastwards for about 30 miles to run along the Lutope River to Lufosi Dip to keep the Lutope cattle from contacting fly north of that river. It also endorsed the provision of a game fence to restrict the southward movement of game towards the Mzola River. Both fences were to be erected and maintained by this Department. Traffic will be canalized through guarded gates in the fences. The Veterinary Department would carry


IMPAMPA RESERVE
SIBABA RESERVE
PASHU RESERVE
CHIZARIRA RANGE
ZAMBEZI
SCHUMWE RIVER
KWIBIZI RIVER
LUBULU CAMP
TSHAJO SPRINGS
SHAKUNDU HILLS
SHAKUNDU CAMP
SIAMBOLA GATE
LINE OF GAME FENCE
KAMATIVI MINE
KALINDA MINE
SUBUMBI GATE
LOOKOUT
MZOLO
BWEGO GATE
CHIMBIRE RUN
CHIMBIRE RIVER
GANDANDA PAN
MBUNGU GATE
CHICOMBA PANS
DIP 5
DIP 4
DIP 3
DIP 2
DIP 1
LUFUSI DIP
CATTLE FENCE
STORE GATE
CENTRAL ROAD
MAHUNDULA STORE
KARNA BLOCK
DIP 8
DIP 7
DIP 6
DIP 5
DIP 4
DIP 3
DIP 2
DIP 1
KWENA RIVER
LUBULU DIP
SHANGANI RIVER
TJOLOLO DIP
SINDOU SIDGE DANKA PANS
NDUNA DIP
CHAGWARA DIP
PUPU DIP
HEMEZWA DIP
TAMU DIP
MKOSI DIP
LUTSHIPYA DIP
SHABULA DIP
MOWANI DIP
LUPANI
MAMULENI DIP
KUBA JIBA DIP
MBULU DIP
FIG. 4.
TSETSE FLY OPERATIONS
SEBUNGWE
English Miles

out curative treatment at infected dips These recommendations have been implemented as far as has been possible. Tenders have been called for for materials and erection of the fences. It is hoped that delivery to the site can be effected before the rains make the Shangani River impassable. The efforts of the Veterinary Department have been successful certainly in controlling and probably in eliminating the disease in the infected kraals. The position will become static only when the challenge from tsetse has been removed.

Reports from various sources confirm that game is increasing rapidly by migration in those regions from which hunters were withdrawn in 1956. The reduction in the area of operations, the concentration of hunters between fences and the prohibition on the sale of meat and hides will lead to greater control over the activities of the hunters, and will drastically curtail the native traffic into and from the tsetse area and with it the carriage of fly to the Kana River and beyond.

The game fence will restrict or prevent the influx of game into the shooting area. As hunting activities proceed, fewer and fewer animals will be shot, until only a small maintenance force of hunters will be required to keep the fenced area free of game.

Elephants are a special problem. Several herds operate from the Dongu River area and move across what will be the fenced area into the Lupani district where they menace native agriculture. It can be anticipated that they will cause damage to the fences, and also assist in the carriage of fly. Repeated representations have been made to the Game Officer for assistance in this matter but, through lack of staff, he has not been able to be more than sympathetic. It may become necessary to undertake their removal as a Departmental exercise. If they are to be removed, the operations should begin before the game fence is erected, so that they can be driven northwards. After the fence has been built their removal may involve their total destruction.

Large settlement schemes are being undertaken particularly in the northern areas. This department is assisting in the settlement of Africans displaced from the Zambezi Valley as a result of the Kariba project. The area of the Lubu Valley is being surveyed to identify the dry season and breeding sites of *G. morsitans* and the distribution of *G. pallidipes*, so that settlement may be directed in such a way as to bring about maximum interference with the tsetse. Water supplies along the Mzola River are being provided for intensive settlement by the Native Department. Here again settlement will be directed towards eliminating fly.

A total of nine traffic control points are now operating. The new gates are the Store Gate, controlling east-west and north-south traffic at the junction of the western boundary road and central road, the Kana Gate near Kana Dip 8 where the road crosses the Kana River, one in the cattle fence near Lubimbi, and another where a new all-weather road crosses the Mzola River. All have demonstrated their usefulness by taking flies from traffic, and serve to indicate the extent to which fly can be carried on traffic.

(f) **Darwin**

No tsetse were taken or seen in the area and no cases of trypanosomiasis recorded. There has been a marked increase in cattle in the area.

The position is satisfactory.

(g) **Eastern Districts: Chipinga**

Forty-two tsetse were caught in the Border Clearing area, all within Portuguese Territory. The traps caught eleven male and eleven female *G. pallidipes*, three male *G. brevipalpis* and two male *G. morsitans*.

Two male and three female *G. pallidipes* and three male and seven female *G. brevipalpis* were caught on man.

No *G. morsitans* have been taken in this region of Southern Rhodesia since 1948.

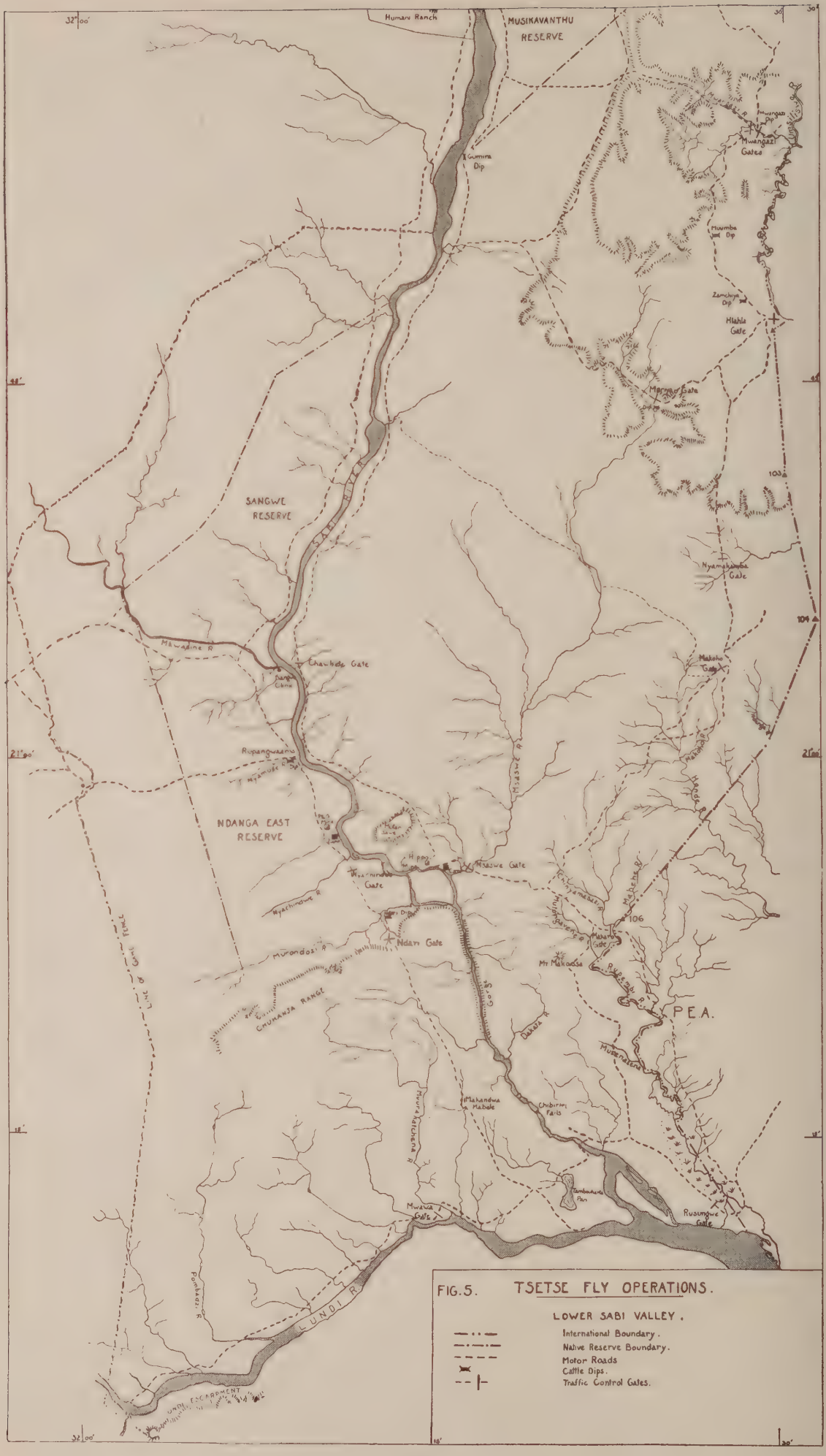
There is little change in the general tsetse position.

A total of twenty-three cases of trypanosomiasis occurred on thirteen farms, including those amongst native-owned cattle on Emerald, Gwenzi, Greymuir and Ndima. Our records since 1950 show that this year had the least number of cases, but the number of farms infected is still above the average.

	1950	1951	1952	1953	1954	1955	1956
Farms infected	10	8	7	7	5	19	13
No. of cases	62	47	28	45	39	85	23

TABLE 2: Incidence of Trypanosomiasis: Chipinga District, 1952–1956.

During February, five cases were diagnosed on Wolfscrag Farm, in a paddock adjacent to riverine thicket on the Chibudzana River. Bush clearing operations involving about 1,000 acres were carried out by this Department in this thicket, since when no further cases have been reported.


Humani Ranch
MUSIKAVANTHU RESERVE
Gumira Dip
Mwangazi Gates
Mwumba Dip
Zambwa Dip
Hlahla Gate
Mamvuri Gate
SANGWE RESERVE
Nyamakumba Gate
Mawadine R
Chawbde Gate
Makoto Gate
Rupangwarmu
NDANGA EAST RESERVE
Ndari Gate
Mt Makoosa
P.E.A.
CHIMANJA RANGE
Mahandwa a Mabale
Chibirrwi Falls
Mudzi Gate
Rusumgwe Gate
LUNDI R
LUNDI ESCARMENT
Pondwani R
FIG.5. TSETSE FLY OPERATIONS.
LOWER SABI VALLEY.
International Boundary.
Native Reserve Boundary.
Motor Roads
Cattle Dips.
Traffic Control Gates.

There is an acute shortage of labour for our operations. Farmers, tea and wattle companies in the area are able to offer more attractive conditions to their African labour.

Activities in the Chipinga District are almost entirely confined to cutting regrowth. Operations are assisted by those farmers who permit a good grass cover to grow so that good fires can be obtained. Others, unfortunately, find that they cannot manage to leave such grass, with the result that scrub growth is encroaching rapidly on their farms.

(h) **Sabi Valley**

(i) *East Bank* (see Fig. 5). Surveys carried out in the area, and information obtained from the traffic control points have added greatly to our knowledge of the extent of the fly encroachment in this area. Some 200 square miles of the east bank area are infested by *G. morsitans*, and until recently the fly was advancing, as indicated by the extension of trypanosomaisis during 1954-55 throughout the Musikavanthu Native Reserve.

The Honde and Rupembi catchment areas and the Msaswe River are infested with *G. morsitans*. The Makossa Hill harbours a fairly dense population and where *Brachystegia tamarindoides* is dominant in the area, *G. morsitans* can be found.

Despite repeated patrols in other areas, no established fly has been recorded. One *G. morsitans* was taken by a Veterinary Department official in the Mwangazi Valley in November, 1955, before traffic control points were organized. No other fly has been taken here although deliberate searches have been made. The large numbers of fly taken subsequently at the traffic control points strongly suggest that this was a carried fly.

G. pallidipes has now been recorded from the Rupembi, Mahehe, Chinyamasaki, Mutungavane, Musenasena and Dakata Rivers and from the Ndanga and Makoho streams. One was taken near the Chibiriri Falls on the east bank of the Sabi River.

The serious outbreak which had developed in the Musikavanthu Reserve mentioned in the Report for 1954-55 has been brought under control. Only three positive cases have been recorded since November, 1955, when a general treatment with Antrycide was administered by the Veterinary Department. These were at Muumbe Dip during January and February. None has been recorded from kraals adjacent to the Sabi. It has frequently been suggested that the infections at Humani, at Rupangwaan's and at Ndari dip on the west bank of the Sabi have been transmitted from the east bank. The virtual absence of disease on the east bank this year and the sporadic occurrences of the disease on the west bank, together with the discovery of established fly on that bank make it almost certain that the west bank infections are derived from west bank fly carried northwards by traffic.

There can be no doubt that the establishment of traffic control points has reduced the fly challenge to the Musikavanthu cattle, and has prevented reinfections.

Certain inexplicable side effects followed the treatment of cattle with Antrycide. The matter was referred to the manufacturers of the drug, who sent two of their chemists to investigate. They recommended a modification of the dosage rate to suit our conditions. Further treatment according to the new recommendations proved to be quite satisfactory.

There is little change in the game situation. Provision has been made for the erection of a game fence of about 30 miles to run from Beacon 103 to Beacon 106 on the Portuguese Border. This will not only prevent the immigration of game, but will assist in reducing the uncontrolled movements of native traffic which undoubtedly spread the fly. The extent to which fly is carried from P.E.A. can be seen from the gate figures, Appendix V. During August, for example, over 380 fly were taken at Makaru gate.

The road from Hippo mine to Mahenya's has been reconditioned so that traffic can be diverted from the road which runs through heavy fly in Portuguese Territory and back into Rhodesia.

Bush clearing operations began in September on the Rupembi watershed. About 270 acres were cleared during the month, leaving selected larger tree species. A mechanical chain saw is being used to compare costs and efficiency with hand labour. The area selected comprises thickets within areas of deciduous woodland, into which neither *G. morsitans* nor *G. pallidipes* could penetrate during the dry season. The success of the scheme will be judged by the effect on traffic control figures and by random catches, since the numbers of flies taken on fly rounds in the area are too small and erratic for reliable comparisons to be made. The future incidence of disease in the Musikavanthu cattle would have given a valuable guide to the efficiency of the clearing but as treatment with Antrycide has been undertaken the non-occurrence of disease may not now indicate absence of fly.

(ii) *West Bank* (see Fig. 5). *G. morsitans* is widely distributed over the western Chuhanja Plateau and can be found where suitable habitat occurs from the Sabi River near Chibiriri Falls to the Muwawa River in the west and the Murondozi to the north. It can readily be taken at Mkandwa-Mabiri, but is scarce further west. The crossing of the Sabi from the infested east bank is likely to have taken place at Chinziawanini just above the Chibiriri Falls.

Only one *G. pallidipes* has been taken from the west bank at Ndari Gate, despite repeated patrols and surveys.

The establishment of tsetse on the west bank and its dispersal northwards by traffic is a serious threat to the Chiredzi, Ndanga East and Sangwe cattle.

A traffic control point established at Ndari on the Chitsa's-Ndanga East Reserve Road has taken 80 *G. morsitans* and one *G. pallidipes* during 11 months of operation. Muwawa gate, established in June, has yielded 24 *G. morsitans* in four months.

Cattle no longer dip at Ndari's, where they formerly contracted trypanosomiasis. They now dip further north at Rupengwaan's, and have not shown the disease since their removal. Occasional trypanosomiasis cases occur at Rupengwaan's and Mateyo and three cases occurred as far north at Humani Ranch, where after treatment of infected cattle the disease disappeared. The position, however, has improved on that of previous years.

Hunting in the area was discontinued in January so that all resources could be directed to cutting a fence line and maintenance road about 80 miles long from the Ramisikana River south of the Lundi, northwards to the Sabi, running five miles to the west of the western boundary of the Sangwe and Ndanga East Reserves. The Field Officer in charge is to be congratulated on completion of a most arduous task in difficult country. Work on the erection of the game fence began in July. On the completion of the fence, a game and cattle free barrier five miles wide will be maintained as protection to the Chiredzi ranching area. Careful records will be kept of game movements and abundance as operations proceed.

3. SURVEYS

Accurate and detailed surveys of the distribution of tsetses and of their habitats are a prerequisite of effective control measures. The information gained from such surveys serves to indicate where control measures can most economically be applied. The maps made from these surveys are made available to the departments of Surveys, Native Agriculture, Police and Irrigation.

(a) **The Fungwe Reserve Survey**

Early in 1954 the presence of trypanosomiasis had been diagnosed by the Veterinary Officers amongst the Fungwe cattle. Owing to the shortage of staff it was not possible to carry out a tsetse survey until late September, 1955. During September and October, Mr. D. F. Lovemore surveyed the northern part of this Reserve and produced his report "A Survey of the Trypanosomiasis Situation in the Fungwe Native Reserve".

The area is triangular in shape, bounded on the north and west by the Mazoe River and on the east by the Nyaderi River. It adjoins the Maramba Native Reserve to the south. A medium ridge runs east and west across the Reserve, forming the watershed, along which native settlement is concentrated.

The major portion of the vegetation is composed of a mixed scrub woodland with *Brachystegia boehmii* Taub, *Julbernardia globiflora* (Benth) Troupin, *Burkea africana* Hook, and *Colophospermum mopane* Kirk ex J. Leonard predominating. At the height of the dry season, this area has a desolated appearance offering little hospitality to animals or tsetse. Within the scrub woodland occur thickets of deciduous species, at times approaching the density of "jesse" bush, but differing from jesse in that it is not associated with deep, often reddish soil.

Foot traverses made along the rivers in what was considered to be the most likely fly habitats failed to discover tsetse.

The conclusion was reached as a result of the survey that fly was not established in the Reserve. Numerous biting flies, *Stomoxys* sp. were taken, and the local natives reported that the biting flies *Haematopota sp.* were usually abundant during January and February.

Although elephant have been reported as being numerous in the Reserve the survey did not record either elephants or recent traces of them.

Tsetse have been recorded occasionally between the Portuguese Border and the Nyaderi River, at isolated spots adjacent to watering places.

An examination of the history of cattle movements recorded on the dip cards, and the evidence supplied by cattle owners suggested that the trypanosomiasis outbreak had arisen in cattle that had watered on the Nyaderi which forms the eastern boundary of the Reserve, and had been distributed within the Reserve by movement of cattle (sale, lobolo or migration of owners), aided by mechanical transmission.

The situation, which had been threatening, has now been retrieved by the construction of a cattle fence across the Reserve and by removal of cattle to the south, and by the therapeutic measures carried out by the Veterinary Department.

East of the Reserve, in the proclaimed tsetse area, operations have been intensified. No tsetse have been recorded this year west of the traffic control point at Suskwe.

(b) **The Lower Sabi Valley Survey**

Early in 1955 a marked increase occurred in the number of cases of animal trypanosomiasis in the Lower Sabi Valley area, in the Chipinga and Ndanga Native Districts. The disease was diagnosed at several dips in the Musikavanthu Native Reserve. Mr. R. Mowbray undertook a tsetse and ecological survey of the area, south of the Mwangazi River to the Sabi-Lundi junction. This survey took place during the year 1954-1955, but was reported in the current year as "Interim Report on a Tsetse and Ecological Survey of the Lower Sabi Valley".

A difficulty experienced in conducting fly surveys in areas where trypanosomiasis occurs sporadically is that of locating the fly where it occurs in very low density. Although trypanosomiasis became widespread in the area by April, 1955, the only recorded established *G. morsitans* on the east bank was within four miles of the Portuguese border, from the Ndanga River southwards to the Sabi. *G. pallidipes* was found to exist in Portuguese territory on the Honde and Rupembi rivers, which drain the lower portion of the Sabi Valley. This species has been taken since on the Sabi River itself.

The survey of the west bank of the Sabi revealed a pocket of established *G. morsitans* at Mkandwa-Mabele near the road from Ndari's to Chitsa's. One *G. pallidipes* was taken on the Mwawa River. There has been a westward advance of both species from Portuguese territory which threatens the cattle on both sides of the Sabi River.

The origin of the outbreak was not clearly understood although sufficient was known to put active control measures into effect. Plans were made, on the recommendation of the Trypanosomiasis Committee, for the construction of a game fence to run five miles to the west of the Sangwe and Ndanga East Reserves, from the Sabi to the south of the Lundi River. Treatment was given to the Native owned cattle in the Musikavanthu Reserve using Dimidium bromide and Antrycide.

As a result of the survey, traffic control barriers were established at strategic points to record all movements of traffic within the area, and to arrest the carriage of fly. In all eight barriers were established. The records obtained from these have clarified the position as regards the distribution of fly. It now appears that the fly is entering Southern Rhodesia along the Rupembi River and its tributaries, aided by dispersal on traffic. As an indication of the potential of carried fly, 382 tsetses were taken at Makaro gate from traffic arriving from Portuguese territory, during August, 1956.

The survey also provided the basic information needed to organize a bush clearing programme for 1956-57 along the Upper Rupembi and its tributaries to restrict the ingress of tsetse from Portuguese Territory.

(c) **The Chirundu "Strip" Survey**

Following the occurrence of two cases of human trypanosomiasis near Chirundu in 1942, it was decided to introduce game destruction operations in a belt of territory extending for five miles on either side of the main road from the base of the escarpment to the Zambezi River at Chirundu. The object of these operations was to reduce the number of tsetse adjacent to the road, and thus protect travellers along the main road against the possibility of infection.

Early in 1956, Mr. Goodier, entomologist, began a survey of the area to assess the effect of game destruction operations on the incidence of fly, and to determine whether the operations were achieving the desired object of reducing the man-fly contact along the main road.

The survey, reported as "A Survey of the Tsetse and Game Position in the Chirundu Area of the Zambezi Valley", included a description of the vegetation according to its ecological types, a review of the game destruction operations and records of fly intensity obtained directly from fly rounds and indirectly from the traffic control points at Makuti and Chirundu.

It was considered as a result of the survey that although there has been some change in the composition of the species shot since operations began, e.g. the percentage of warthog has increased, there is no indication that game has been eliminated from the area. In fact, the average number of animals killed per month is remarkably constant at just over five, despite the fact that the hunters were increased from 13 to 26 in December, 1954. There are no records from fly rounds in the area prior to this survey, but from comparison of figures of fly taken at the traffic control points since 1942, and the intensity of fly noted on the fly rounds it would seem that there has not been a marked reduction of fly as a result of these operations. During 1954, eleven cases of human trypanosomiasis in Africans were reported from the Chirundu area, with four deaths, twelve years after operations began. From October, 1955, to September, 1956, five cases were reported with one death. There is little evidence that the operations have materially affected the disease position.

It must be concluded that these operations have not achieved the desired object of reducing game or fly, and with it the threat to travellers along the main Chirundu road in the Zambezi Valley, and that operations could be discontinued without adversely affecting the fly position. Indeed, for an area such as the Chirundu strip to be rapidly cleared of fly it would be necessary to isolate the area by means of fences to ensure that game did not re-invade it, and to bring about a rapid elimination of the game animals within the fences, coupled with a direct attack on the fly in its dry season haunts.

(d) **The Kana River Survey**

During April, 1956, one *G. morsitans* was caught by a Tsetse Field Officer on the Mabonono River about five miles south of the Kana River. At the same time the Veterinary Department reported an outbreak of trypanosomiasis at Lusulu Dip, some eight miles to the east of the recorded capture. Later inspections indicated that the disease was widespread in the area between the Shangani and Kana rivers.

Mr. H. Brayne carried out a survey of the Kana River area and of the Sikoba-Singe-Danke pans to discover established fly. No fly was reported from possible habitats, but occasional fly was taken at traffic control points adjacent to the Kana River area. The situation suggests that occasional fly have been carried by traffic and possibly game from the infested areas along the Mzola and Lutope rivers, to the Kana River area, setting up infections at the dipping points. Movement of infected cattle aided by mechanical transmission has undoubtedly extended the disease.

There has been an advance of fly westwards toward Lubimbi where carried fly have been caught, and the disease recorded in cattle.

It seems abundantly clear that the utmost restriction should be placed on the movement of cattle in areas where trypanosomiasis occurs until the disease is considered to be under control.

(e) **The Tsetse Area South of the Lundi River**

The Sabi Valley tsetse area includes an area of about 175 square miles in extent, lying south of the Lundi River, bounded on the east by the Portuguese border, and on the west by the Ramisikana (Nyamasikana) River. Little was known of the fly potential of this area, and as the Sabi West Bank game fence would terminate in this region it was necessary to undertake a tsetse and ecological survey.

Mr. R. Mowbray, entomologist in charge of the area, together with Mr. Middleton-Stokes, Field Officer, carried out a survey between 11th and 27th August, 1956, during which time work was hampered by the occurrence of extensive veld fires. This survey is reported as a "Survey of Tsetse Area South of Lundi", August, 1956.

The area is extremely arid with poor agricultural potential, and although fly is established in low density adjacent to the Portuguese border south of Beacon 107, along a strip some 20 miles long by six miles wide, there is little likelihood of its extension westwards as the vegetation is totally unsuitable. Game animals are fairly well distributed throughout the area in the wet season. In the dry season their concentrations are influenced by water supplies. Two major movements take place as the waterholes dry out. One occurs eastwards to the pans in Portuguese territory and to the Rio Save and the other to the Lundi and the Ramisikana rivers. These movements and their significance from the point of view of spread of disease would be factors to be considered in any future plans for introducing cattle into the area. Elephant, giraffe, buffalo, nyala and most other species of buck were recorded during the survey.

4. CONTROL MEASURES

(a) **Game Destruction**

The acceptance of the policy of game destruction as a method of control of tsetse continues to arouse the indignation of some sections of the public. It should be recorded, however, that the Commission of Inquiry reported in para. 233, page 36, that "Having reviewed the various methods of control in use in various parts of Africa, and those suggested by various witnesses, we conclude that the only ones we can recommend for serious consideration and investigation as to application to the territory's problems are discriminative clearing, combined with close settlement, and in special circumstances, the use of modern insecticides; but it must be clearly stated that until the proper methods of application of these new measures have been worked out, it will be necessary to continue modified game destruction under more strict control".

Furthermore, in a paper delivered recently to the I.S.C.T.R. Conference at Salisbury the Director of Tsetse Control, Uganda, reported that some 5,000 square miles of territory in Uganda had been cleared of *G. morsitans* by means of game destruction alone.

There is clearly a place for game elimination in the preliminary stages of tsetse control, under present circumstances. During the year under review, the operations have been modified in accordance with the recommendations of the Commission of Inquiry. Game fences are being or have been erected in the Mtoko, Sabi and Sebungwe districts as a means of preventing influx of game into areas to be maintained as a game free barrier, and to indicate a precise boundary to the areas involved in game elimination operations. An increase in the number of European Tsetse Field Officers has been authorized so that a more intensive but more limited campaign can be conducted, at the conclusion of which there should be little or no game within the barriers to be killed. The satisfactory progress of the operations would be indicated by a progressive decrease in the number of game killed. For example, there is evidence in the figures for Urungwe Native Reserve that a decline is taking place, accompanied by a decrease in fly. (Fig. 2.)

The total area over which hunting operations have been conducted has been reduced during 1956. All hunters have been withdrawn from the eastern half of the Urungwe Native Reserve; no game elimination operations have been conducted on the west bank of the Sabi. All hunting operations in the Sebungwe District have been concentrated south of 18° 15′ S., the approximate line of the game fence, which means that the depth of operations in this area has been reduced to about half.

The effect on the game figures of restricting the areas and concentrating the effort is illustrated in Figure 5A, where the monthly totals of all game shot show a progressive decline. The total for September is rather less than half of that for January. This decline is consistent with what could be expected from an intensive game elimination campaign within a restricted area. During this year some hunters have been used for other duties such as bush clearing and cutting fence lines.

The total game eliminated amounted to 34,208 animals of all kinds (Table 3), for an expenditure of 101,275 rounds of ammunition, giving an average of 2.96 rounds per animal. This figure compares with 41,576 for the period 1st October, 1954, to 30th September, 1955. Game larger than duiker amounted to 12,097 and small game to 22,111. Thus small game formed 64.6% of the total. All elephant were shot by European officers.

It is of interest to record that Lichtenstein's hartebeest was taken in the Mtoko District, our first record for this area.

TOTAL OF ALL GAME KILLED IN ANTI-TSETSE OPERATIONS
OCTOBER 1st, 1955 — SEPTEMBER 30th, 1956.

Larger Game		Small Game and Carnivores	
Elephant	122	Duiker	9,239
Rhinoceros	4	Klipspringer	316
Zebra	304	Suni	1
Buffalo	426	Oribi	41
Hartebeest	28	Sharp's Grysbok	573
Tsesseby	238	Steenbock	1
Waterbuck	343	Bushpig	1,721
Reedbuck	615	Warthog	4,704
Sable	1,169	Baboon	5,414
Roan	178	Wild Dog	39
Eland	266	Hyena	36
Kudu	4,247	Cheetah	2
Bushbuck	2,252	Leopard	23
Impala	1,903	Lion	1
Wildebeeste	2		
	12,097		22,111

Larger Game	12,097
Small Game	22,111
	34,208

Small Game formed 64·6% of all game shot.

TABLE 3: Total of all game killed in anti-tsetse operations —October 1st, 1955 — September 30th, 1956.

(b) Use of Fences

In order to restrict the movements of game, and to aid in the control of hunters by confining shooting operations between fixed limits, an extensive fence building programme has been undertaken. Traffic to and from tsetse areas is directed through strategically placed gates in the fences.

The game fence in the Mtoko District stretching for about 45 miles between the Mazoe and Ruenya rivers was completed in October, 1955.

A game fence is in course of erection in the Bikita and Ndanga East Native Districts, to protect the ranching areas lying to the west. It will run for about 78 miles from the Ramisikana River, south of the Lundi River, northwards to the Sabi at a point about five miles north of the northerly beacon of Sangwe Reserve, and will serve to prevent movement of game westwards to the Chiredzi ranches.

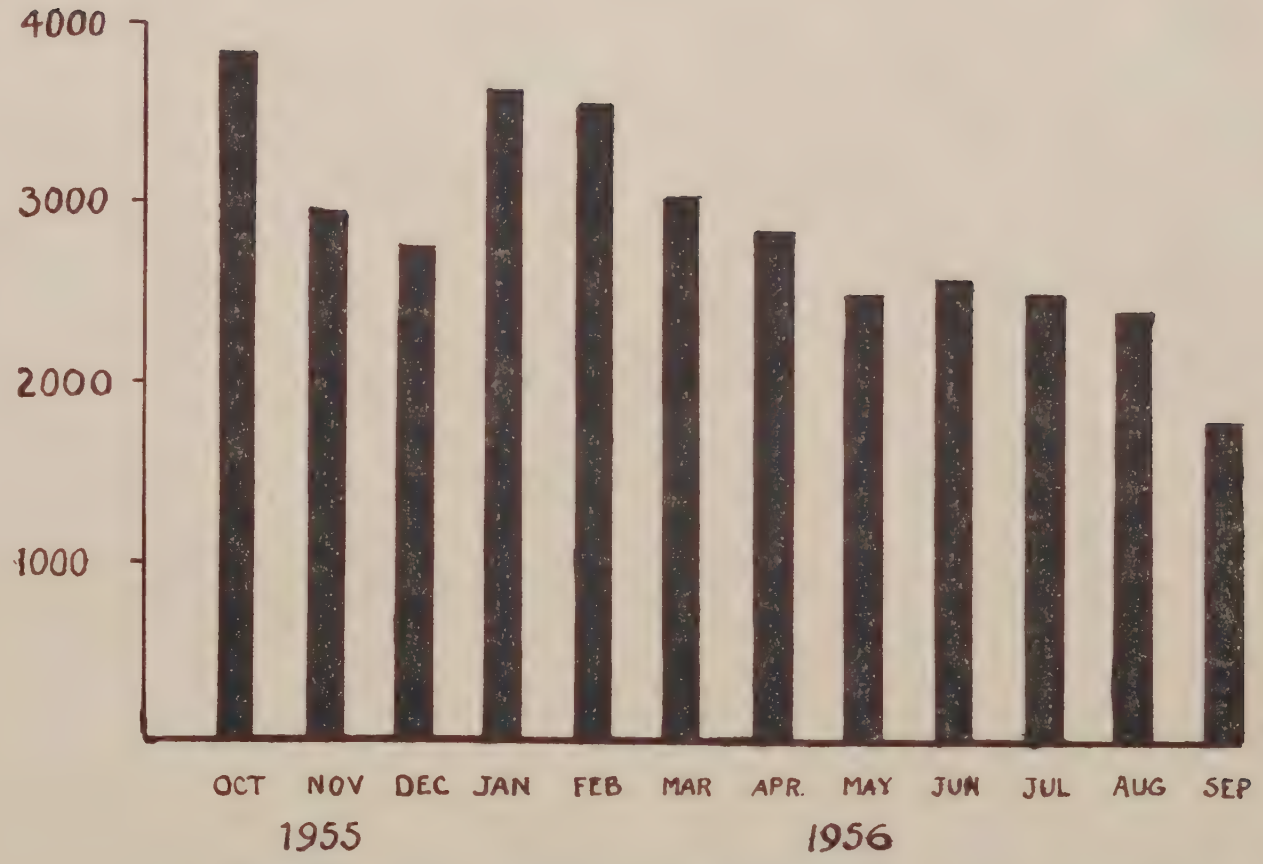


FIG. 5A MONTHLY TOTALS OF ANIMALS KILLED, 1955-1956.

On the east bank of the Sabi, about 30 miles of game fence will be erected between Beacons 103 and 106 to restrict the movement of game from Portuguese territory, and to help control the unrestricted movement of natives from tsetse infected areas.

In the Sebungwe District the existing cattle fence is being extended eastwards for about 32 miles and the entire 110 miles of fencing will be maintained by this Department. A game fence is being constructed to run east and west for 80 miles along a line approximately 18° 15′ S., Fig. 4. There has been difficulty in finding a contractor to build the game fence. The figure quoted for its erection is considered to be exorbitant. It would be more economical for the Department to undertake its erection.

(c) **Aerial Spraying** (Fig. 6)

In the Annual Report for 1954-55, the Director of Tsetse Operations indicated that an area of approximately half a mile wide on the south bank of the river would be cleared of bush around the central construction area, amounting to about five square miles of clearing. The Federal Power Board, having made tentative inquiries about clearing costs, found that considerable sums of money would be involved, and asked the Trypanosomiasis Committee to confirm that such an undertaking would be warranted. Representatives of the Trypanosomiasis Committee and of the Federal Power Board (then the Hydro Electric Board), met on 8th March to review the position. It was considered that clearing of bush would be an expensive undertaking under conditions existing at Kariba and, as the season had progressed since the original decision had been taken, would not bring about a rapid reduction in fly in the neighbourhood of the Kariba township. It was decided to investigate the possibilities of applying insecticide from the air, based on information and recommendations contained in Mr. Lovemore's report on his survey of the area. Mr. Burnett, of the Colonial Insecticide Research Unit, was invited to inspect the area and advise on the use of aircraft. Mr. Burnett, in company with Dr. Webster, of the Federal Power Board, Dr. Cockbill, Mr. Lovemore and Mr. Phelps of this Department, met at Kariba on 22nd March to discuss the problem. Within a few days, Mr. Burnett submitted his report which advised the application of "block" spraying adjacent to the township and a linear application to the outerlying rivers. The requirements of the Federal Power Board were that tsetse in the township area should be reduced or eliminated and protection afforded for a period of 18 months, by which time the area would be flooded. The spraying programme involved eight applications of a 4% γ BHC solution in diesoline applied at the rate of approximately 0.1 gallons per acre, with droplets of a mass median diameter of 60 to 65 microns. An area of about 8 square miles bounded by the Kassesse River, the main access road and the township received complete coverage at each cycle. Further east, only the vegetation bordering the Chavaru and the Nyanyanya rivers received applications, in all occupying about 7 square miles. (See areas A and B in Fig. 6.)

Every effort was made to begin operations by 1st May. Fortunately a local contractor was available with suitable small aircraft that required only minor modifications. The type used was the Tiger Moth carrying 50 gallons of a 4% γ BHC solution in diesoline, delivered by electric pumps to the exhaust stacks. A series of tests on the droplet size of the aerosol emitted from the exhaust stacks were made, based on a technique recommended by Dr. Yeo of C.I.R.U. Adjustments were made in the spray nozzle sizes until the required droplet size was obtained. The spray unit was then standardized for this type of aircraft. During the spraying operations, repeated tests were made on the droplet size and delivery rate of the aerosol, using magnesium oxide plates as indicators of droplet size.

It is pleasing to report that operations proceeded smoothly throughout the eight cycles, aided particularly by a long spell of suitable weather conditions. Owing to the prolonged wet season, however, leaf fall did not occur as early as had been anticipated, and the eighth cycle was completed before the flies had concentrated on the riverine vegetation. On the recommendation of this Department, the Federal Power Board agreed to continue operations for a further three cycles, concentrating on the riverine vegetation. Here difficulties arose. Further supplies of insecticide were required immediately. By the very considerate co-operation of Klipfontein Organic Products, supplies of a concentrated solution of BHC were made available within three days and railed to Kariba. Unfortunately, delay in transport meant that a break occurred in the series of applications. When the ninth, tenth and eleventh cycles were applied to the riverine vegetation the general woodland was beginning to come into leaf, and the flies to disperse. However, the object of the operations had been achieved within the given expenditure. It can now be assumed that there are no concentrations of tsetse between the Kassesse River and the site of operations at Kariba, except for the upper headwaters, where the vegetation was apparently too dense and flying conditions too severe for successful application of aerosol. The fly has been reduced but by no means eliminated from the neighbourhood of the Chavaru and Nyanyanya rivers, approximately seven and nine miles respectively in a direct line from the dam site.

Figures 7, 8 and 9 show the relevant fly round catches, expressed at total old males per fly round. The Kassesse fly round situated within the area that received complete cover indicated that the population received a severe check at the first application of aerosol between 4th and 16th May and has not shown much sign of recovering. The Chavaru and Nyanyanya fly rounds which run within the area where only the riverine vegetation received treatment show that the first spraying

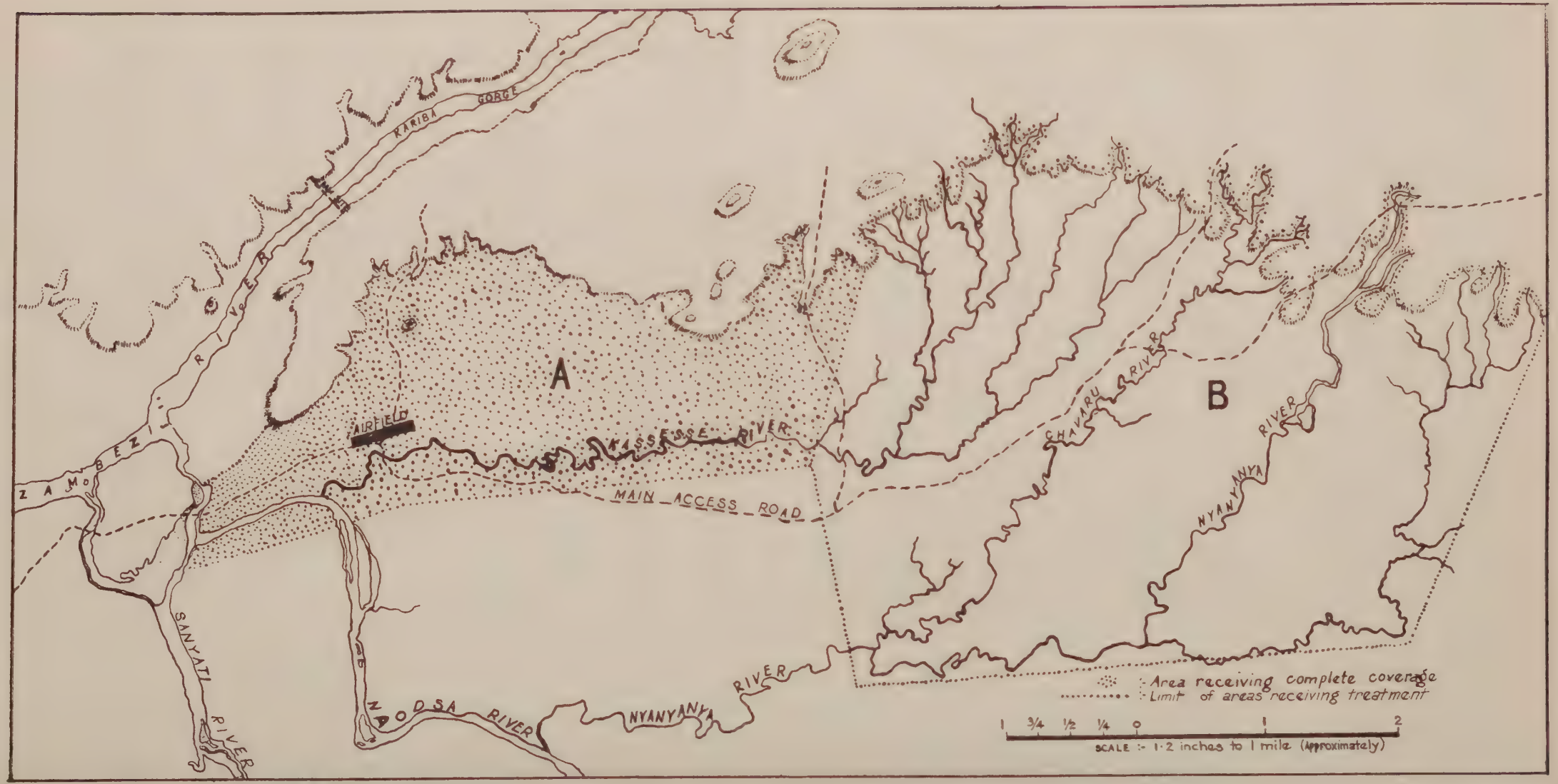


FIG.6. : MAP SHOWING KARIBA AERIAL SPRAYING OPERATIONS

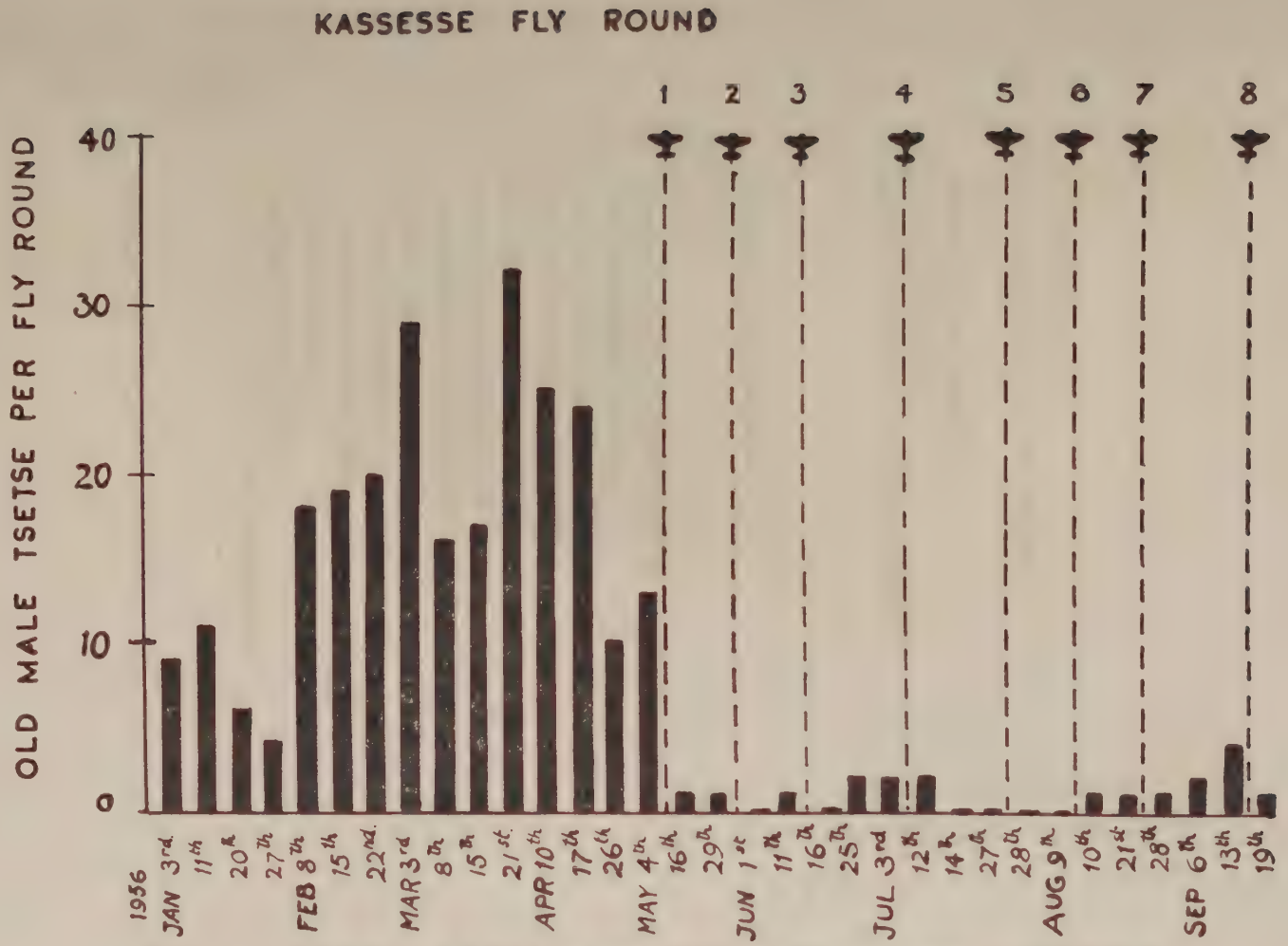


FIG. 7. KARIBA AERIAL SPRAYING: ENTIRE AREA TREATED.

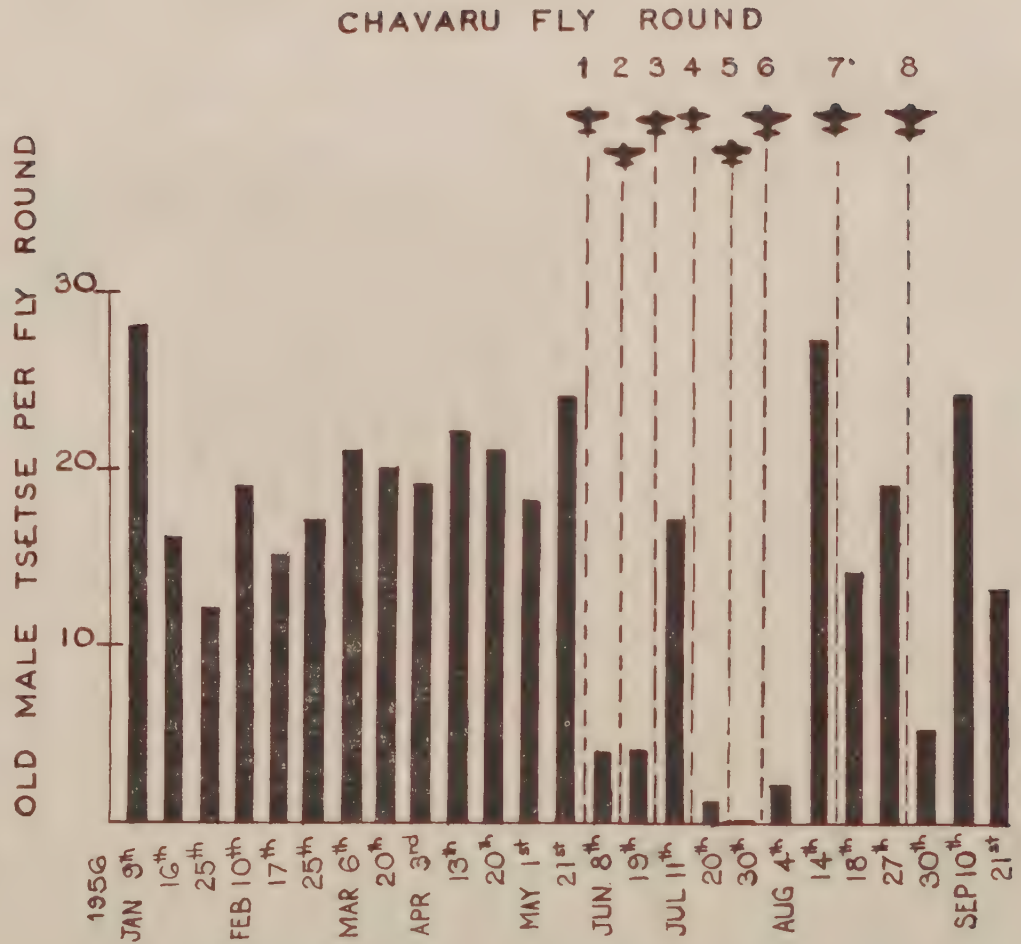


FIG. 8. KARIBA AERIAL SPRAYING: RIVERS ONLY TREATED

FIG. 9 KARIBA AERIAL SPRAYING RIVERS ONLY TREATED

produced a marked effect on the fly, and that although the subsequent applications brought about a reduction in available fly, the population rapidly built up. During August and September the increase in the fly round catches became more pronounced as the interval between the application of aerosol and time of making the fly round increased. This increase in the catches of old males is to be attributed to immigration from the surrounding woodland as the conditions there became more severe. This concentration of tsetse on the riverine vegetation appears to be a feature of *G. morsitans* in the lowveld in this country.

It was stressed from the start that the success of aerial spraying is dependent upon the degree of isolation that could be given to the township area. It is surrounded by tsetse habitat, except where it is bounded by the Zambezi River. Traffic control points were established on the access roads including a cleansing chamber and barriers, at which Swingfog machines were used successfully. Captures of fly are recorded elsewhere, Appendix II. There is a constant pressure of fly from beyond the treated area but if vigilant control can be maintained over traffic entering that area it is very unlikely that the fly will re-occupy its habitats between the Kassesse River and the township.

There is no record of human trypanosomiasis having been contracted within the area since operations began.

The situation will be carefully watched, and the fly rounds maintained until flooding takes place.

(d) **Swingfog Machines**

As reported in the Annual Report for 1954-55, preliminary trials were carried out at Kariba with Swingfog machines as a means of eliminating tsetse from small patches of riverine thicket. Suitable atmospheric conditions occurred after dusk, and continued until about an hour after dawn. Operations were therefore confined to these periods. It was found that the practical difficulties of cutting paths in the thick riverine vegetation, of maintaining adequate control of operations at night in thick bush, and of recruiting a sufficient labour force to work under these arduous conditions were such as to limit the use of these machines for this kind of work. They were found to be very effective, however, when used during the daytime to cleanse the large volume of traffic arriving at the Kariba township site. Experiments were conducted to devise a suitable technique.

The machines were first calibrated for droplet size of the aerosol emitted, using a 4% gamma BHC in diesoline and for performance with various nozzles and jets, and with various commercial insecticides. In comparing the efficiency of these insecticides adult *G. morsitans* in cages were used. It was concluded from these investigations that the 1.0 mm. flow jet using the 4% gamma BHC in diesoline gave quicker kills of tsetse and a more efficient fog than other combinations.

To assess the efficiency of the insecticidal fog in killing tsetse carried on traffic, caged flies were attached to various parts of vehicles which were then driven slowly through the fog generated by the machines stationed at the roadside. Controls were kept in cages for all trials.

Considerable effort is required to carry out these trials with caged tsetses. The day previous to the trial is spent travelling to a suitable site where large numbers of tsetses may be caught alive and caged. They are transported back to camp under conditions as far as practicable approaching 100% humidity. They are fed on human blood overnight, and the survivors set out on the experimental site on the following day. Since wild flies were used, they were of different ages and in various physiological conditions and trials in a series were carried out on different days. These factors may account for the lack of close agreement in some of the results. However, the general conclusions are of the order of obviousness, and further information may only be gained from more precise laboratory experiments.

It was found from experiments with magnesium oxide plates that the cages reduced the amount of insecticide reaching the insect to a marked degree. It would appear, then, that if a certain dosage of insecticide could achieve kills on caged flies, it should be more effective against uncaged flies for equal exposure times. It was found effective to use dosage rates that would kill caged flies within an hour after exposure to the fog for five seconds.

This Department undertook the training of personnel of the Federal Power Board in the use and maintenance of these machines. The Federal Power Board has now assumed responsibility for cleansing traffic entering the township area, while this Department acts in an advisory capacity.

In one series of trials caged flies were attached to various parts of a vehicle which was driven through a cloud of insecticide produced by a Swingfog machine using 4% gamma BHC in diesoline. Exposure was about five seconds. Table 4 gives the times in minutes elapsing between exposure and death of the insect.

Jet Sizes	Position of Cages						
	Exposed side of Truck	Lee side of Truck	In Cab	Under Truck	Within Canopy	On top of Truck	Control
0·8 mm.	40 mins.	52·5 mins.	130 mins.	85 mins.	238 mins.	98 mins.	318 mins.
1·0 mm.	20 mins.	30·0 mins.	237 mins.	88 mins.	173 mins.	38 mins.	503 mins.
1·2 mm.	20 mins.	65·0 mins.	178 mins.	65 mins.	143 mins.	63 mins.	258 mins.
1·4 mm.	22·5 mins.	40·0 mins.	105 mins.	33 mins.	100 mins.	38 mins.	265 mins.

TABLE 4: Times elapsing between exposure and death of adults of *Glossina morsitans* after passing through an insecticidal fog while caged to a truck.

It will be seen that flies in the less accessible parts of the vehicle, such as within the cab or under the canopy, took longer to succumb than those caged on the exposed parts. However, from comparison with the times taken for the caged control flies to die it is evident that even here exposure to the fog proves to be lethal.

From tests with caged flies on pedestrians and cycle traffic it was shown that more rapid kills were obtained than for flies caged on vehicles. The fog was found to be more effective when confined between vertical screens of tarpaulin, but the practical difficulty of arranging screens to accommodate the several kinds of traffic dealt with at Kariba far outweighed the advantage of increased efficiency.

Having shown their value in trials, the machines were used on the daily traffic approaching the Kariba township from tsetse areas. The machines were operated from 8 a.m. to 4 p.m. on weekdays, but the gate guards captured and recorded fly from dawn to dusk. Thus, on any day, some traffic received treatment and some did not. Fly was also recorded on days when there was no spraying.

Table 5 gives the recorded catches of fly from treated and untreated traffic.

	Catch with no treatment	Catch during treatment
Spray period (8 days)	25	—
No spray (7 days)	48	—
Spray period (11 days)	64	49
TOTAL	137	49

TABLE 5: Comparison of catches of tsetse with and without treatment.

Clearly treatment resulted in a lower catch of fly compared with no treatment. Flies caught on traffic that had been treated (e.g. 49 in Table 5) were caged and the death rate recorded. They all died within one hour. The mean survival rate for males was 19.7 minutes and for females 25.0 minutes, so that flies which had encountered the insecticide were doomed.

Trials carried out at Makuti Gate on the main Sinoia-Chirundu road confirmed that Swingfog machines can be used to cleanse main road traffic of fly rapidly and effectively.

The method, however, was not found to be practical when used in conjunction with cleansing chambers. The dense fog produced by diesoline based insecticides not only reduced visibility within the chamber to nil, but the irritation produced on the mucous membranes made it annoying to the drivers of vehicles and unbearable to the operators. Paraffin based insecticides yielded less unpleasant fogs with far better visibility, but the lower flash point of these compounds made them unsafe for use within a confined space.

The performance of a Microsol machine, the property of the Federal Power Board was compared with that of the Swingfog in the cleansing chamber. The machine consists of a two stroke petrol engine with a whirling disc type of atomizer. It has the advantage over the Swingfog of eliminating all thermal decomposition of insecticide, and of producing a more uniform droplet size. The fog produced is, moreover, not opaque. It was found that the output of the Microsol machine was so low that it took fully five minutes to fill the cleansing chamber. Pyrethrum insecticides were superior to BHC in diesoline in these tests, but it was found that satisfactory kills could only be obtained after exposure for 10-15 minutes, which would be impracticable for our purposes. It was also found that the fog produced from BHC in diesoline was wetter than that produced by the Swingfog and gave rise to unpleasant stains on vehicles and fabrics.

Further tests are continuing on the use of Swingfogs.

(e) **Bush Clearing**

(i) *The Chipinga Barrier Clearing.* Operations on barrier clearing have been mainly confined to cutting regrowth. This work is made increasingly difficult and expensive for the Department by the practice of some local farmers of overgrazing and failing to organize grass fires fierce enough to destroy the regrowth. Much valuable grazing land is being overgrown by bushes. It is becoming apparent that the operations are assuming more and more the character of pasture improvement in this area, rather than anti-tsetse operations.

Following an outbreak of five cases of cattle trypanosomiasis on Wolfscrag Farm in February in a paddock adjacent to a thicket on the headwaters of the Chibudzhana River, bush clearing operations were carried out to cut up the thicket, since when no further cases have been reported from the vicinity.

(ii) *Riverine Clearing: Rupembi Drainage Area.* Tsetse surveys carried out in the lower Sabi Valley have indicated the probable routes by which tsetse have invaded this area from P.E.A. It would seem that the outbreaks of trypanosomiasis in the Musikavanthu Reserve during 1955 can be attributed to fly having infiltrated along the Rupembi River and its tributaries, aided by dispersal on traffic.

A bush clearing programme has been undertaken within the Rupembe watershed. During September some 270 acres of riverine vegetation and ecotone had been cut. A two-man mechanical chain saw has been used in conjunction with teams of natives using axes. The saw compares favourably in speed of operation with 16 axemen. In this work such large species as *Acacia nigrescens, Sclerocarya caffra* and *Kirkia acuminata* have been spared, and only the lower canopy cut away.

It is anticipated that this clearing will provide an effective barrier to the migration of *Glossina* from P.E.A. in this region. Since there is a very low density of fly in the area, the effects of the operation will be assessed indirectly by the incidence of trypanosomiasis amongst the Musikavanthu cattle and by the traffic control returns.

(iii) *Bush Clearing in conjunction with Settlement.* The displacement of Africans from the Zambezi Valley as a result of the Kariba project and their resettlement in the Sebungwe District present problems of considerable interest to this Department. The area chosen for settlement in the Lubu Valley is infested with both *G. pallidipes* and *G. morsitans* and is an area where human trypanosomiasis formerly occurred. Tsetse and ecological surveys are in progress to locate the concentration and breeding sites of these species, so that settlement can be directed towards their elimination. The effect of these operations on the tsetse population and that of an aerial spraying programme will be measured by means of fly rounds, catches with bait oxen and with traps.

5. TRAFFIC CONTROL

Traffic control points are established on the major access routes leading to and from tsetse infested areas. They serve to restrict the carriage of tsetse into fly free territory and are also a means of detecting the presence or probable absence of fly in an area, as the totals of fly taken at the gates will show (see Appendices). Preliminary statistical analysis of past records indicate that the records from these gates are not always a direct indication of the relative abundance of fly. At points where traffic is light, such as in the Sebungwe and the western Urungwe, there is evidence that a high correlation exists between the number of units of traffic and the number of fly taken. In these cases the number of flies per unit of traffic can be taken as an index of the availability of fly. But where the volume of traffic is very large, such as along the Karoi-Chirundu road, it may be said to saturate the available fly, and there is no simple relationship between the number of units of traffic and the number of fly. In these cases, the volume of traffic has increased exponentially but the number of fly has not increased, and here the total number of fly taken would serve as a better indication of abundance of fly than the number per unit of traffic.

The number of control points has been increased during the year from 26 to 38, due to improved control in the Sabi Valley, Kariba and Sebungwe areas. Each post is manned by uniformed gate guards armed with a fly net and hand spray pump. As traffic arrives at the control point it is first examined for fly and any available are caght in the net. In the case of vehicles insecticide is then pumped around and underneath to disturb any fly. Around each traffic control point for a radius of quarter of a mile all trees and bush have been cut down, so that natural shade is denied any fly dislodged from the traffic. Artificial shade is provided at the roadside by open sided grass huts, the under surfaces of the roofs of which are liberally treated with a persistent insecticide. Fly are attracted to the shade, where they come into contact with the insecticide, and are killed.

At Vuti on the Karoi-Chirundu road, Suskwe on the Mtoko-Changara road, Makaha on the Mtoko-Chikwizo road, at Nagupande in the Sebungwe District, Catkin in the Urungwe District and Magunge in the Urungwe Native Reserve, traffic is cleansed of fly within chambers.

At Vuti, where the traffic exceeds an average of 1,700 southbound cars per month, the situation has been reached where several vehicles may be kept waiting while the chamber is in use. Under these conditions flies may leave the stationary vehicles before they are treated, and the value of the chamber thus reduced. To deal with this situation, Swingfog machines were tried at Makuti gate, some 25 miles to the north, to replace the hand catching method generally in use. Preliminary trials indicated that these machines could quickly and effectively cleanse traffic of fly, thus reducing the danger of fly escaping from traffic held up awaiting treatment at Vuti.

6. ROADS

The prolonged wet season caused considerable deterioration in the condition of our bush roads. Determined efforts were made to make them negotiable. About 1,400 miles were maintained, including almost 300 miles of new roads.

7. HUMAN TRYPANOSOMIASIS

The incidence of human trypanosomiasis was again low. Six cases, all Africans, were recorded with one death: One from Mtoko and one from Beatrice in Africans who had contracted the disease in P.E.A., and five from the neighbourhood of the Zambezi Valley.

8. I.S.C.T.R. CONFERENCE

The sixth meeting of the International Scientific Committee for Trypanosomiasis Research was held at Salisbury from 24th to 29th September, under the Chairmanship of Mr. J. K. Chorley, who with the Director of Veterinary Services, was Federal delegate. Dr. Ross, Dr. Blair, Mr. Mackinnon, Mr. Mowbray and Dr. Cockbill were official observers.

Representatives were present from the United Kingdom, France, Belgium, Portugal, the United States of America, the Union of South Africa, the Federation of Rhodesia and Nyasaland, and from W.H.O.

Over 30 papers were read. These and the discussions which followed were informative and stimulating. Valuable contacts were made with workers from other countries, with whom our mutual problems were freely discussed.

The proceedings of the meeting are in course of preparation for publication.

9. ACKNOWLEDGMENTS

I have pleasure in acknowledging the material help given by the staffs of other departments, particularly by Native Commissioners in assisting in recruiting labour, by the Veterinary Officers in making their records available to my field staff, by the Director of Federal Surveys in providing maps, and by the C.M.E.D. in their ready assistance in our many transport problems.

I am particularly indebted to Mr. Davison, of the Wankie Game Reserve, for his help in providing heavy transport at a time when, through lack of transport, we were desperate for food supplies in the Sebungwe District.

I have to record with thanks the loyal and enthusiastic co-operation of the staff during a difficult and uncertain year.

GERALD F. COCKBILL,
Acting Director.

TRAFFIC CONTROL — URUNGWE NATIVE RESERVE: OCTOBER 1st, 1955 - 30th SEPTEMBER, 1956

		EAST BOUND												WEST BOUND												
		Cars				Cyclists				Foot					Cars				Cyclists				Foot				
		No.	Tsetse			No.	Tsetse			No.	Tsetse			Total	No.	Tsetse			No.	Tsetse			No.	Tsetse			Total	Grand Total
			M	F	T		M	F	T		M	F	T			M	F	T		M	F	T		M	F	T		
Nyamtora Style	m	—	—	—	5,599	—	—	—	5,612	—	—	—	—	—	—	—	—	5,634	—	—	—	5,662	—	—	—	—	—
East Fence: Magunge Chamber	3,258	—	—	—	1,852	—	—	—	2,249	—	—	—	—	3,052	—	—	—	2,026	—	—	—	2,402	—	—	—	—	—
Central Fence: Karambanzungu Gate	133	2	—	2	1,410	17	5	22	1,529	16	4	20	44	139	—	—	—	1,403	—	—	—	1,539	—	—	—	—	44
Central Fence: Cheoka Gate	575	—	—	—	1,583	5	4	9	1,177	—	—	—	9	571	—	—	—	1,605	—	—	—	1,264	—	—	—	—	9
Central Fence: Badze Gate	1,119	—	1	1	1,551	—	1	1	1,408	—	—	—	2	988	—	—	—	1,654	—	—	—	1,446	—	—	—	—	2
Central Fence: Tengwe Gate	239	—	—	—	3,073	—	—	—	3,068	—	—	—	—	237	—	—	—	2,994	—	—	—	3,179	—	—	—	—	—
Western Fence: Chiroti Gate	463	86	41	127	1,192	96	53	149	657	71	36	107	383	492	24	17	41	1,331	43	33	76	536	45	20	65	182	565
Western Fence: Zemaiwe Gate	116	—	—	—	649	21	14	35	573	—	2	3	38	143	—	—	—	636	—	—	—	664	—	—	—	—	38
Western Fence: Kawaya Gate	30	—	—	—	1,270	—	—	—	1,331	—	—	—	—	31	—	—	—	1,307	—	—	—	1,311	—	—	—	—	—
		SOUTH BOUND												NORTH BOUND												
North Fence	m	6	5	11	2,287	14	6	20	2,357	7	6	13	44	96	—	—	—	2,366	—	—	—	2,485	—	—	—	—	44
Nzoe Gate	91 p	2	—	2	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	2
		EAST BOUND												WEST BOUND												
Sanyati Gate (3 months only)	60	44	11	55	115	54	6	60	48	28	11	39	154	43	22	17	39	83	60	49	109	67	37	26	63	211	365

m — G. morsitans.
p — G. pallidipes.

TRAFFIC CONTROL — KARIBA GORGE OPERATIONS, 1st OCTOBER, 1955 – 30th SEPTEMBER, 1956

	EAST BOUND													WEST BOUND												Grand Total
	Cars				Cyclists				Foot					Cars				Cyclists				Foot				
	No.	Tsetse			No.	Tsetse			No.	Tsetse			Total	No.	Tsetse			No.	Tsetse			No.	Tsetse			Total	
		M	F	T		M	F	T		M	F	T			M	F	T		M	F	T		M	F	T		
Kasese Barrier (2 months only)					TRAFFIC NOT EXAMINED									3,234 m	94	99	193	5,327	58	71	129	34,031	34	36	70	392	392
Kariba Barrier m	6	8	14	4,996	6	3	9	10,847	11	6	17	40	12,976	108	101	209	3,560	110	11	225	8,930	84	69	153	587	627
13,296 p	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	1	—	1	—	—	—	—	2	2
Nyakasanga Barrier	6,882 m	111	70	181	1,851	74	61	135	1,912	78	55	133	449	7,477	59	28	87	1,821	35	19	54	2,027	41	28	69	210	659

NORTH URUNGWE

	EAST BOUND													WEST BOUND												
Catkin Chamber	335 m	2	5	7	2,316	—	1	1	2,326	—	—	—	8	333	—	—	—	2,303	—	—	—	2,444	—	—	—	—	8
Manyangau Gate	302 m	4	3	7	2,225	—	—	—	2,978	—	—	—	7	303	7	2	9	2,053	—	—	—	3,402	—	1	1	10	17

	NORTH BOUND													SOUTH BOUND												
Chirundu Gate	15,038 m	152	133	285	2,212	167	129	296	2,236	150	113	263	844	14,699	—	—	—	2,313	—	—	—	2,136	—	—	—	—	844
Makuti Gate	18,512 m	—	1	1	2,608	4	1	5	1,425	6	1	7	13	16,401	48	51	99	1,645	27	29	56	1,561	32	26	58	213	226
Vuti Chamber	20,247 m	—	—	—	2,571	—	—	—	2,850	—	—	—	—	20,778	28	17	45	2,776	1	1	2	2,782	2	—	2	49	49

m — G. mortisans.
p — G. pallidipes.

TRAFFIC CONTROL — MTOKO DISTRICT — 1st OCTOBER, 1955 - 30th SEPTEMBER, 1956

	EAST BOUND													WEST BOUND													
	Cars				Cyclists				Foot					Cars				Cyclists				Foot					
	No.	Tsetse			No.	Tsetse			No.	Tsetse			Total	No.	Tsetse			No.	Tsetse			No.	Tsetse			Total	Grand Total
		M	F	T		M	F	T		M	F	T			M	F	T		M	F	T		M	F	T		
Sutskwe Chamber	3,259	—	—	—	318	—	—	—	222	—	—	—	—	3,207	1	—	1	317	—	—	—	338	—	—	—	1	1
Border Gate	3,053	15	9	24	39	8	1	9	208	5	3	8	41	2,669	17	21	38	31	3	2	5	215	2	3	5	48	89
Makaha Chamber	1,002	—	—	—	1,994	—	—	—	2,015	1	—	1	1	1,000	1	—	1	2,023	1	1	2	1,926	1	2	3	6	7

	NORTH BOUND													SOUTH BOUND													
Mkota Gate	424	—	—	—	1,010	—	—	—	2,024	1	—	1	1	445	2	—	2	1,011	—	—	—	2,037	1	—	1	3	4

TRAFFIC CONTROL — SEBUNGWE DISTRICT — OCTOBER 1st, 1955 – SEPTEMBER 30th, 1956.

EAST BOUND

	Cars				Cyclists				Foot					Grand Total
	No.	Tsetse			No.	Tsetse			No.	Tsetse			Total	
		M	F	T		M	F	T		M	F	T		
Store Gate	172	1	—	1	276	2	—	2	330	1	—	1	4	6
Nagupande Chamber (disc. 8.8.56)	207	36	31	67	97	75	62	137	258	64	40	104	308	1,603
Siambola Gate	264	41	19	60	107	29	6	35	271	29	8	37	132	431
Dongamusi Gate	72	—	—	—	287	6	5	11	643	4	5	9	20	45

WEST BOUND

	Cars				Cyclists				Foot					Grand Total
	No.	Tsetse			No.	Tsetse			No.	Tsetse			Total	
		M	F	T		M	F	T		M	F	T		
Store Gate	190	—	—	—	178	—	—	—	197	2	—	2	2	6
Nagupande Chamber (disc. 8.8.56)	227	295	226	521	87	378	121	499	253	205	70	275	1,295	1,603
Siambola Gate	260	48	56	104	124	98	47	145	279	39	11	50	299	431
Dongamusi Gate	75	1	1	2	278	8	9	17	634	2	4	6	25	45

NORTH BOUND

	Cars				Cyclists				Foot					Grand Total
	No.	Tsetse			No.	Tsetse			No.	Tsetse			Total	
		M	F	T		M	F	T		M	F	T		
Mbungu Gate	74	—	2	2	571	1	5	6	445	2	—	2	10	329
Store Gate	15	—	—	—	441	—	1	1	585	—	—	—	1	9
Lubimbi Gate (2 months only)	34	—	—	—	34	—	—	—	133	—	—	—	—	3
Borehole 60	86	—	—	—	248	1	—	1	510	—	1	1	2	14
Mzola Gate	252	1	2	3	106	2	5	7	310	1	4	5	15	162
Kana Gate (1 month only)	14	—	—	—	142	—	—	—	372	—	—	—	—	1

SOUTH BOUND

	Cars				Cyclists				Foot					Grand Total
	No.	Tsetse			No.	Tsetse			No.	Tsetse			Total	
		M	F	T		M	F	T		M	F	T		
Mbungu Gate	73	36	19	55	642	145	61	207	503	33	24	57	319	329
Store Gate	27	—	—	—	548	4	3	7	584	—	1	1	8	9
Lubimbi Gate (2 months only)	37	1	2	3	23	1	—	1	82	—	—	—	3	3
Borehole 60	90	—	1	1	261	8	3	11	541	—	—	—	12	14
Mzola Gate	244	41	20	61	110	29	26	55	348	19	12	31	147	162
Kana Gate (1 month only)	13	1	—	1	145	—	—	—	364	—	—	—	1	1

TRAFFIC CONTROL — SABI VALLEY — EAST BANK

		EAST BOUND												WEST BOUND												Grand Total
		Cars				Cyclists				Foot				Cars				Cyclists				Foot				
		No.	Tsetse			No.	Tsetse			No.	Tsetse			No.	Tsetse			No.	Tsetse			No.	Tsetse			
			M	F	T		M	F	T		M	F	T		M	F	T		M	F	T		M	F	T	
Rusungwe	m	—	—	—		—	—	—		—	—	—	—		7	9	16		12	12	24		100	86	186	226	226
	33				108				800					41				69				1,033				
	p	—	—	—		—	—	—		—	—	—	—		—	—	—		—	—	—		1	1	2	2	2
Msaswe	m	—	—	—		—	1	1		—	1	1	2		—	—	—		10	9	19		4	6	10	29	31
	178				402				1,564					148				411				1,706				
	p	—	—	—		—	—	—		—	—	—	—		—	1	1		—	1	1		—	2	2	4	4
Makaro (since 1.1.56)	m	7	3	10		27	28	55		78	65	143	208		131	109	240		318	156	474		226	108	334	1,048	1,256
	54				195				742					57				152				758				
	p	—	1	1		—	—	—		—	—	—	1		—	—	—		—	—	—		—	—	—	—	1
Mariya	125 m	—	—	—	331	—	—	—	1,493	—	—	—	—	123	—	—	—	401	—	—	—	1,529	—	—	—	—	—
Mwangasi 3 (since 1.1.56)	167 m	—	—	—	1,614	—	—	—	3,654	—	—	—	—	180	—	—	—	1,765	—	—	—	3,464	—	—	—	—	—

		SOUTH BOUND												WEST BOUND												
		Cars				Cyclists				Foot				Cars				Cyclists				Foot				
		No.	Tsetse			No.	Tsetse			No.	Tsetse			No.	Tsetse			No.	Tsetse			No.	Tsetse			
			M	F	T		M	F	T		M	F	T		M	F	T		M	F	T		M	F	T	
Mwangasi 1 (since 1.1.56)	151 m	—	—	—	416	—	—	—	329	—	—	—	—	202	—	—	—	328	—	—	—	264	—	—	—	—	—

		NORTH BOUND												SOUTH BOUND												
		Cars				Cyclists				Foot				Cars				Cyclists				Foot				
		No.	Tsetse			No.	Tsetse			No.	Tsetse			No.	Tsetse			No.	Tsetse			No.	Tsetse			
			M	F	T		M	F	T		M	F	T		M	F	T		M	F	T		M	F	T	
Mwangasi 2 (since 1.1.56)	272 m	—	—	—	1,103	—	—	—	1,056	—	—	—	—	354	—	—	—	1,046	—	—	—	1,030	—	—	—	—	—
Makoho (since 1.1.56)	m	4	1	5		4	6	10		5	8	13	28		1	—	1		—	1	1		—	3	3	5	33
	140				1,178				2,027					126				1,182				2,144				
	p	3	2	5		4	3	7		9	4	13	25		—	—	—		1	1	2		3	—	3	5	30
Chahwete	156 m	—	—	—	2,283	—	—	—	3,572	—	—	—	—	175	—	—	—	2,208	—	—	—	3,000	—	—	—	—	—

TRAFFIC CONTROL — SABI VALLEY — SABI WEST BANK

	EAST BOUND													WEST BOUND													GRAND TOTAL
	CARS				CYCLISTS				FOOT					CARS				CYCLISTS				FOOT						
	No.	TSETSE			No.	TSETSE			No.	TSETSE			TOTAL	No.	TSETSE			No.	TSETSE			No.	TSETSE			TOTAL	
		M	F	T		M	F	T		M	F	T			M	F	T		M	F	T		M	F	T		
Muwawa Gate	43 m	—	—	—	73	1	—	1	360	—	—	—	1	31	—	—	—	74	9	1	10	589	10	3	13	23	24

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NORTH BOUND — SOUTH BOUND

Ndari Gate	64 m	—	1	1	234	14	5	19	1,697	17	3	20	81 41 unsexed	64	—	—	—	223	—	—	—	1,610	—	—	—	—	81
	p	—	1	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Nyachindwe	25	—	—	—	69	—	—	—	613	—	—	—	—	25	—	—	—	86	—	—	—	496	—	—	—	—	—

m — G. mortisans.
p — G. pallidipes.